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JPRS 82053

22 October 1982

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USSR Report

TRANSPORTATION

No. 98

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22 October 1982

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AIR

GENERAL FIGURES ON WORK OF AGRICULTURAL AVIATION

Moscow EKONOMICHESKAYA GAZETA in Russian No 35, Aug 82 p 1

[Article: "The Contribution of Agricultural Aviation — the USSR Food Program"]

[Text] Agricultural aviation is playing a prominent part in the campaign to raise agricultural yield in all the republics, krays, and oblasts. Our country knows no equal for scale of use of airplanes and helicopters in agriculture. Aviation performs 40 percent of the total volume of work in application of mineral fertilizers and chemicals, more than half of the work to protect plants against pests and weeds, and almost all defoliation of cotton.

As the table below indicates, in the 11th Five-Year Plan the farmers' airborne helpers will perform aviation chemical work on almost 500 million hectares. About 800 new paved landing strips and landing zones for helicopters will be built in the five years. Modernization of the fleet of agricultural aircraft will be done on a large scale.

Table. Growth in Volume of Aviation Chemical Work (by Five-Year Plan, hectares)

Five-Year Periods	Hectares
1966-1970	363.8 million
1971-1975	431.1 million
1976-1980	464.0 million
1981-1985 (Plan)	490.0 million
1986-1990 (Draft Plan)	520.0 million

Aeroflot workers are working to develop shipment of foodstuffs and fresh vegetables and fruits, especially to Siberia, the Far North, and the Far East. Plans for the current five-year plan envision delivering more than 2.5 million tons of food to these regions.

Soviet aviation workers are laboring unselfishly to make a full contribution to carrying out the Food Program approved by the May 1982 plenum of the CPSU Central Committee.

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CSO: 1829/330

AIR

BUGAYEV DESCRIBES CIVIL AVIATION'S ROLE IN FOOD PROGRAM

Moscow EKONOMICHESKAYA GAZETA in Russian No 35, Aug 82 p 2

[Interview with USSR minister of civil aviation, Boris Pavlovich Bugayev, occasion, date, and place not specified]

[Text] [Question] All sectors of the national economy are taking part in carrying out the USSR Food Program. Would you tell us please, Boris Pavlovich, what tasks have been given to civil aviation?

[Answer] The resolutions of the May 1982 Plenum of the CPSU Central Committee, which ratified the Food Program, are directly relevant to civil aviation. Civil aviation has become an essential technological link in the production process in many sectors of the economy. A vivid example of this is our agricultural aviation, which is expected to actively promote chemicalization of agricultural production. In his report at the July 1978 Plenum of the CPSU Central Committee, Comrade L. I. Brezhnev spoke of the need to devote much more attention to agricultural aviation because of the great promise of this line of development.

In the time that has passed since then agricultural aviation has developed further. The volume of aviation chemical work has grown by almost 5 million hectares. The fleet of agricultural airplanes and helicopters is larger. Two hundred-sixty paved runways and about 300 helicopter landing zones have been built. More than 260 support bases have been put into operation. Aviation workers are helping protect the environment.

In the current five-year plan aviation chemical work will encompass an area of up to 500 million hectares. Thus, the workers of agricultural aviation together with the people laboring in the fields are on the forward edge of the struggle for the harvest.

I would like to mention that a large majority of the thousands of airborne grain farmers are members of our glorious Soviet youth. Up to 80 percent of aviation chemical work is done by Komsomol-youth crews.

[Question] How do you characterize the efficiency of using aviation in agricultural production?

[Answer] The aviation method of applying chemicals is as good as surface techniques in terms of technical, administrative, and economic efficiency and is significantly better for a number of important indicators.

There are broad opportunities to maneuver with aviation taking into account the climatic zones of the country. This makes it possible to concentrate aircraft very quickly in the necessary regions at the necessary moment. This year, for example, during the campaign against weeds in the fields of Kazakhstan more than 11 million hectares were treated from the air. This work was carried on simultaneously by 800 aircraft belonging to many civil aviation administrations.

Large amounts of aviation chemical work were done in the North Caucasus, Ukraine, Volga region, and Nonchernozem Zone of the Russian Federation. In August and September the cotton in Uzbekistan and the other cotton-growing republics will have to be defoliated over an area of up to 6 million hectares. We will use up to 1,300 aircraft for this purpose.

And what are the final results of the work of aviation? According to the most modest calculations of experts the gain in yield of grain crops is at least two quintals per hectare. When mineral fertilizer is applied by aviation the savings of labor per million hectares is up to 1,600 workers of field brigades and about 1,200 tractors are freed.

[Question] What are the principal lines of further development of agricultural aviation and raising the quality and efficiency of its use? What are the difficulties and unsolved problems in this respect?

[Answer] The demands made of agricultural aviation are rising in light of the resolutions of the May 1982 Plenum of the CPSU Central Committee. We must also continue building up its material-technical base.

First of all we need a more productive agricultural aircraft to replace the outdated An-2. What is the most feasible and relatively quick way to do this? It is to modify the existing fleet of aircraft. The Ministry of Aviation Industry has developed and tested the An-3 aircraft based on the An-2. The new aircraft has better technical-economic characteristics. The thing now is to speed up organization of serious production of this aircraft, above all of the engine.

Civil aviation repair plants have a large role in modification of the An-2. We must also set up and organize series production of a new light agricultural helicopter.

Another problem is the critical shortage of onboard agricultural apparatus and equipment to mechanize aviation chemical work. I have in mind such things as a removable suspended unit for helicopters to spread fertilizer, ultrafine sprinkling apparatus, a device to measure the weight of chemicals in the tanks of An-2 airplanes and Mi-2 and Ka-26 helicopters, and much more.

Given current technology of aviation chemical work we desperately need a special radio navigation system to replace signalmen. Its introduction will greatly

improve the quality of aviation chemical work and free thousands of kolkhoz and sovkhoz workers for productive labor. However, the Ministry of Aviation Industry is moving slowly on development of this equipment.

The problems of mechanizing the loading of chemicals onto aircraft are difficult to solve. Airplanes are loaded by obsolete machinery and helicopters are loaded by hand. The Ministry of Tractor and Agricultural Machine Building still has not incorporated series production of a loading machine capable of handling both airplanes and helicopters.

I have mentioned only a few of the problems which are limiting the efficiency of use of agricultural aviation. It might seem that these are not such big problems. But the state is losing many thousands of tons of grain and other food products because of delay in solving them.

Aviation workers need the help of the industrial ministries and are hoping that they will do everything necessary to provide agricultural aviation with all the good-quality equipment it needs.

I want to touch on one other question. Runways and landing zones are an important part of the material-technical base of agricultural aviation. The kolkhozes and sovkhozes have about 2,000 of them. Another 700 are to be built during this five-year plan.

But construction of them has not been satisfactorily organized everywhere. For example, during the last five-year plan the plan for construction of paved runways in the central regions of Russia was only 27 percent fulfilled. Therefore, our ministry and the executives of civil aviation administrations and enterprises are obligated, together with the Soviet and agricultural bodies in the local areas, to step up efforts for further development and strengthening of this part of the material-technical base of agricultural aviation.

While joining efforts with the industrial ministries and the USSR Ministry of Agriculture, the workers of civil aviation must use all their reserves to continue expanding the scale and types of aviation work in agriculture. We must act more vigorously to introduce new advances of our science and practice into use.

I will mention only a few of them. There is the aviation technology for obtaining strong wheat with an increased protein content, which has been introduced extensively in the North Caucasus and the Ukraine. There is non-root top dressing of potatoes, dessication of sunflower and lupine, and aerial rice sowing. Technologies are being developed for using biological preparations to control the pests of agricultural crops.

Ultrafine sprinkling is an achievement of agricultural aviation science and production in the fight against winter and spring wheat weeds. In the last two years more than 3 million hectares in Kazakhstan has been treated by this technique. As a result, the productivity of flights increased 65 percent and the prime cost of treating a hectare of agricultural land was reduced 39 percent. The savings was about 2 million rubles.

At the same time the enterprises of agricultural aviation have substantial reserves and opportunities at their disposal. The experience of the leaders in competition illustrates this. The greatest seasonal output in aviation chemical work last year was achieved by the crews of the An-2 airplanes commanded by V. Zabolotnyy from the Tselinograd aviation detachment, G. Belyarchik from the Kiev detachment, and I. Poletayev from the Dnepropetrovsk detachment. The average seasonal output per crew in these detachments was 20,000-30,000 hectares. We must raise the level of professional skills of agricultural aviation workers and constantly look after measures to improve conditions for work and recreation.

In our concern for the efficiency and quality of aviation work in agriculture we must improve the organization of this work. Not everything is as it should be here. Equipment downtime owing to the fault of aviation enterprises as well as kolkhozes and sovkhozes is still large. We must solve problems of ground organization through Sel'khoztekhnika associations. Experience with this has been gathered in Kazakhstan where aircraft downtime was reduced by an average of 20 percent.

One more important question is improving the indicators of planning aviation chemical work. A major drawback of the principal indicator of aviation use in the national economy, the indicator of "calculated flight hours," is that the pilot's wages do not depend on the amount of land treated or the quality of the work, but rather on hours in the air. It is obvious that we must work out planning indicators that will promote the greatest increase in the efficiency and quality of aviation chemical work. Such a system should be introduced at aviation enterprises in 1983.

[Question] What other tasks is Aeroflot performing under the Food Program?

[Answer] One of them is hauling foodstuffs, fresh vegetables, and fruit, chiefly to Siberia, the Far North, and the Far East. During the current five-year plan air transport will deliver more than 2.5 million tons of food and 150,000 tons of fruit and vegetables to remote regions of the country.

These loads must be given the "green light." It is the duty of aviation workers to improve this shipping and prevent losses when this freight is received at airports and during transportation.

Organization of this work also demands joint actions with the industrial ministries. The questions of building a new freight aircraft and development and broad production of special containers are coming onto the agenda.

The workers of civil aviation greeted the resolutions of the May 1982 Plenum of the CPSU Central Committee and the speech of General Secretary of the CPSU Central Committee Comrade L. I. Brezhnev at the Plenum with profound satisfaction. In early June a meeting of command and executive personnel and production leaders of the sector was held. This meeting defined the practical tasks of civil aviation in carrying out the Food Program.

Meetings of party and economic activists were held in all administrations and republic production associations of the sector with the agreement of local party bodies. These meetings reviewed the questions of direct participation by collectives in fulfilling the resolutions of the May Plenum.

The ministry has worked out a comprehensive target program to raise the efficiency and quality of use of aviation in agriculture. The program is calculated for the period until 1990 and covers a broad range of questions.

[Question] The readers of the newspaper would be interested in how work is going to fulfill the 1982 plan.

[Answer] Aviation workers are preparing to celebrate the 60th anniversary of the USSR with new labor victories. Civil aviation fulfilled its plan assignments for the first six months and seven months of 1982. We carried 63 million passengers and 1.8 million tons of freight and mail, including about 15,000 tons of fresh vegetables and fruits. Aviation chemical work was done on an area of more than 80 million hectares.

Now is the most important period of production activity. Therefore, we must strive to see that every working day and every trip is highly efficient and that all assignments are unconditionally fulfilled. The strictest economies must be observed with all types of resources. In this connection conservative, thrifty use of aviation fuel is decisive for fulfillment of the plan.

Civil aviation workers are concentrating their labor efforts on celebrating the 60th anniversary of the USSR in a worthy fashion.

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CSO: 1829/330

AIR

FLIGHT PERSONNEL COMMENT ON EXPERIENCE FLYING NEW YAK-42

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 7, Jul 82, pp 18, 19

[Comments by aviation subunit personnel: "The Yak-42: Operating Experience"]

[Text] The new Yak-42 passenger plane has been used for almost two years on Aeroflot lines. This 120-passenger liner was developed at the design bureau of Twice Hero of Socialist Labor A. S. Yakovlev. It is designed for flights on short trunk routes and for local air routes.

The new Aeroflot plane flies from Moscow to Donetsk, Zhdanov, Izhevsk, Krasnodar, Nalchik, Kherson, and a number of other cities. In addition it serves the overseas lines from Leningrad to Helsinki, from Leningrad to Tampere, and from Kiev to Prague.

The important assignment of putting this new aircraft in the air was given to the collective of the Bykovo Aviation Enterprise.

(E. Bykov, commanding officer of the flight subunit)

In terms of flight performance, design, and piloting-navigation equipment the Yak-42 is a qualitatively new aircraft. It differs substantially from the jet aircraft of earlier generations in numerous respects. Particular assemblies, systems, and units of equipment in the aircraft are the latest word in science and technology in every way.

First of all, in the new airplane the processes of air navigation have been maximally automated. Thus, the navigation equipment includes an onboard digital computer which works on the principle of self-contained Doppler calculation of the route. In addition, the plane has a set of radio navigation equipment that makes it possible to use ground equipment both on domestic Soviet and on international routes and to perform automated approaches for landing according to the first and second ICAO [International Civil Aviation Organization] categories.

These and other features of the plane demand maximum training and good flight skills from flight personnel. That is why the very best people have been and

are being selected for the Yak-42. Thus, the first group chosen to be trained as commanders of the ships was made up of instructor-pilots of An-24 and Yak-40 aircraft with first class ratings and at least 5,000 hours of independent flying time. Experienced plane commanders with independent flying time of more than 2,500 hours were recommended to be co-pilots. Only specialists first class were selected to be flight mechanics.

During preparation for independent flying primary attention was devoted to drilling flight personnel in the ICAO minimum. For this purpose intensified training periods to practice landing approaches in complex meteorological conditions using the SIV-T-42 hood were organized. At the present time almost all ship commanders have been authorized to fly under minimum conditions of the first ICAO category.

What are the main things our subunit has learned from operating the Yak-42? First of all, in our opinion, we have realized all the main technical demands that were made of the plane during the design period. The Yak-42 can be used at airports with relatively short runways. Thanks to good mechanization of the wing (slats, flaps, interceptors, and the like) the takeoff run under full take-off weight does not exceed 750-900 meters, and the landing run is in the range 1,000-1,200 meters. The Yak-42's landing approach speed does not exceed 210 kilometers an hour, which is significantly less than other similar aircraft.

(Ye. Romanov, deputy subunit commanding officer for political affairs)

We recently observed the second anniversary of the formation of the Yak-42 flight subunit in the Bykovo Aviation Enterprise. This subunit was formed from flight personnel who not only had substantial flight experience but also excellent moral-political qualities. Each candidate for retraining for the Yak-42 was discussed by the party organization of the collective and approved by a mandate commission of the enterprise. We were sure that all the specialists chosen were capable of successfully mastering the new aircraft and then putting it into use on Aeroflot routes.

Organizational and political indoctrination work to prepare the crews for carrying passengers was undertaken on a broad scale in the collective. The party, trade union, and Komsomol organizations of the subunit developed socialist competition for the quality of operational testing of the Yak-42 and for the right to participate in the first passenger trip.

Thorough discussions were held at the council of ship commanders with all candidates for commanding officer of a Yak-42, and careful preliminary preparations were carried out with the crews as a whole. Bulletins, "combat news sheets," and posters were published in honor of those in the subunit who had successfully gone through training and been authorized for independent flight.

And then the day came. The crew of the Yak-42 consisted of commanding officer L. Filatov, co-pilot V. Kalymanov, and flight mechanic V. Safonov. On 22 December 1980 they initiated regular passenger traffic in the new aircraft by flying the route from Moscow to Krasnodar. The aviators dedicated their first trip to the 26th CPSU Congress and sent a report to it.

The party and government praised the contribution of our flight collective to mastering the new aircraft. Ten aviation workers were given high awards of the Motherland. Ship commanding officer L. I. Filatov was awarded the Order of Lenin; subunit commanding officer E. A. Bykov received the Order of the Labor Red Banner; ship commanding officer V. G. Orlov was awarded the Order of Friendship Among Peoples; and, the "Badge of Honor" order was given to instructor-pilot Ye. I. Kucher, flight mechanic-instructor V. I. Safonov, ship commander V. V. Timofeyev, and subunit navigator V. N. Savel'yev. Ship commanders Yu. S. Sokol and V. B. Kalymanov and flight mechanic N. S. Novikov were awarded the Order of Labor Glory 3rd Degree.

Discussing the challenges that face the collective of the Yak-42 flight subunit in the 11th Five-Year Plan, many crews came forward with the initiative of struggling to see that all trips made in this aircraft are exemplary. This initiative was widely supported by all personnel of the subunit and also by the ground services of the enterprise.

(L. Filatov, commanding officer of a Yak-42)

A good aircraft has joined Aeroflot. That is the opinion of all our crews. The plane has a high power-to-weight ratio. With three engines it can continue cruising when one engine fails and can perform a normal landing when two engines have failed. The cockpit is conveniently planned. The instruments, equipment, and control elements are arranged to create favorable conditions for crew work in all phases of flight. Gaining altitude, horizontal flight, and descending from the flight level require minimal expenditures of energy and time for operations to control the aircraft.

But the Yak-42 also has distinctive characteristics which one must know. For example, take gaining altitude or flight in the base leg. After leaving the ground the aircraft's speed increases rapidly, which requires prompt reversing of the stabilizer to remove pushing forces. Pilots who have undertaken to master the Yak-42 must not forget that control of the stabilizer is discrete.

The use of a special asymmetrical stabilizer with a leading edge deflected upward is one of the main features of the aerodynamic design of the aircraft. Pitch control and longitudinal balancing of the Yak-42 are accomplished by an elevator and a rotating fin, like all contemporary aircraft. But the asymmetrical profile makes it possible for the stabilizer to attain large deflection angles (2-12 degrees) during takeoff and landing and thus increase its efficiency while preserving adequate moment for balancing in takeoff and landing regimes.

The Yak-42 does not "like" an abrupt decrease in speed in the base leg. This worsens controllability, demands heavy use of the controls, and makes failure likely. Therefore, the engine control levers must be operated smoothly during a descent and before landing. Vigorously retracting them before landing usually leads to a sharp reduction in speed, and this may affect the "cleanness" of the landing.

(Yu. Morozov, ship commander)

After retraining I was one of the first in the subunit to fly in the Yak-42. I liked this plane right away. After all, its improved takeoff and landing characteristics make it possible to fly from runways 1,800 meters long and the plane reaches its flight level of 9,000 meters in 15 minutes. The minimal fuel consumption for this class of aircraft (about three tons an hour) makes it possible to carry 120 passengers a distance of 1,500 kilometers at an average speed of 750 kilometers an hour. The built-in ramp and carrying luggage in containers are other features that made it possible to improve passenger service.

As a pilot I am still today amazed by the amount of sophisticated equipment included in the complex systems. This demands heightened intellectual labor, more than physical labor, from us. But I must admit that the systems make work in the air much easier.

The Yak-42 does not have a navigator, and for us the digital computer has become a full-fledged "crew member," like the autopilot on other aircraft, for example. At first we were slightly prejudiced against it, preferring the old, tested methods of navigation by radio compasses, beacons, and the like. Then we quickly learned how conveniently and efficiently the computer helps us work, making it possible to precisely determine deviation from the axis of the route, determine the flying time to points and lines, and solve many other problems of air navigation in flight. As a pilot I have also been able to appreciate the capabilities of the aircraft during an approach in the automatic regime under difficult meteorological conditions according to the first category ICAO minimum (60×800 meters).

Like every airplane, naturally, the Yak-42 has its special features, and some involve piloting techniques. But I am convinced from my own experience (I used to fly the An-24) and the experience of other pilots that retraining flight personnel from third-class ships (of the An-24 and Yak-40 classes) goes "painlessly," that is these characteristics and habits are quickly acquired.

But new equipment demands a new approach to the selection of flight personnel and the level of professional training. Therefore, we are carefully analyzing the work of each crew member. We are constantly inviting specialists from the design bureau, test pilots, and systems developers to visit us so that we can ourselves learn new things and teach others. As in every new job we have our problems. But we believe in the plane and we believe it has a great future.

(A. Roshchin, navigator)

The tactical-technical specifications of the Yak-42 envision crew work without a navigator. The functions of the navigator are performed by an onboard computer. In many ways it makes the work of pilots easier by continuously computing the position of the airplane, the direction and velocity of the wind, and the distance and bearings to selected points on the route. Moreover, all this is done with great accuracy.

Nonetheless, this in no way diminishes the role of the crew. In particular, the co-pilot receives navigator duties (for example monitoring the route traveled).

Therefore, carefully training the co-pilot on the ground and skillful use of the navigation complex during flight will guarantee successful performance of each flight. But this demands that the crew have a thorough knowledge both of the navigation complex and of the specific characteristics of air navigation.

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CSO: 1829/334

AIR

MINISTER REVIEWS PLANS FOR RAISING EFFICIENCY OF CIVIL AVIATION

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 8, Aug 82 pp 14-15

[Article by I. Ye. Mashkivskiy, deputy minister of civil aviation: "Following the Line of Intensive Development"]

[Text] One of the essential conditions for successful fulfillment of the comprehensive program outlined by the 26th CPSU Congress to raise the efficiency and quality of work by civil aviation is to step up the sector's transition to primarily the intensive path of development. This means that the efforts of our employees should aim at broad introduction of scientific-technical advances, at rational, truly proprietary use of production potential, and at all possible economies of means. The principal challenge that follows from the policy of raising production efficiency may be formulated as follows: we must strive to see that the final results of our work grow faster than expenditures for it.

The material base which makes it possible to meet the needs of the economy and the population for air transport is the fixed capital of the sector. The fleet of aircraft is its principal component. Already today it constitutes more than half of all fixed productive capital. That is why significant reserves for raising the efficiency and quality of all our work are concealed in rational use of airplanes and helicopters.

The program of development of civil aviation for the upcoming 10 years envisions extensive updating of the basic fleet of airplanes and helicopters. Medium-range plans have been written for basing and mastering the use of new aviation equipment. Plans also envision modernization of the airships in use, refinement of their weight and aerodynamic characteristics, and installation of new piloting-navigation equipment. New, more economical modifications of airplanes and helicopters will be designed.

Putting new equipment into use promises substantial advantages: fuller satisfaction of the needs of the population and economy for aviation services and improvement in the economic indicators of production activity. But to actually obtain these advantages and achieve higher levels of profitability and return on profit with the higher cost of new airships it is essential to raise the efficiency of use of airplanes and helicopters and reduce their maintenance expenditures. This refers to existing aviation equipment as well.

The simple truth that the use efficiency of airplanes and helicopters is higher where they spend less time on the ground needs no special proof. Nonetheless, the preparation of an airship for flight sometimes drags on unjustifiably. The first thing planned to reduce this unproductive downtime is an improvement in the organization of work, incorporating more progressive methods of technical servicing and repair, and raising the level of mechanization of these processes. The introduction of technologies that consider the actual condition of the aviation equipment will be adopted as the general line to improving forms of servicing. The crucial condition for introduction of progressive new methods of technical operation of aviation equipment is establishing diagnostic laboratories and having them gradually develop into major diagnostic centers.

The practical results that have been achieved (and already today the Tu-134, Yak-40, and Il-62M aircraft are serviced by the technical conditions of particular assemblies and aggregates) confirm the possibility of achieving a significant savings of labor and material resources. We must work harder to introduce progressive methods of work on other classes of airships and begin them on the Il-86 and Yak-42 aircraft immediately. By 1984 50-60 percent of all the parts of aircraft with gas turbine engines should be switched to operation according to actual conditions. This will permit a significant reduction in labor-intensiveness and improve the quality of technical servicing. Broad introduction of effective methods of monitoring the technical condition of assemblies and units of airships, above all more active use of onboard objective monitoring means and ground units to process flight information should facilitate performance of this important task.

It must be kept in mind that to successfully introduce progressive methods of technical servicing it is necessary not only to have an appropriate production base, but also to concentrate the complex, labor-intensive job — by classes of airplanes and helicopters — in large specialized air technical bases.

Questions of development of the production base of the aviation engineering service are particularly critical today. This includes construction and reconstruction of hangars, docks, production and domestic facilities, and providing mechanized means and laboratory and monitoring-testing equipment. To solve these problems it will be necessary to carry out a broad program both by centralized financing and using local resources, the capital of large customers who enjoy Aeroflot services, and the production development fund. Strengthening the base will make it possible to improve working conditions and raise the labor productivity of aviation specialists. It will also permit reducing the time that the airship is down for technical servicing.

One of the most important indicators of the efficiency of aviation equipment is its reliability. This is understandable because delays in trips for technical reasons impair flight regularity, have a negative impact on economic indicators, and draw justified complaints from passengers. As the result of work done by operations enterprises and scientific research organizations of civil aviation in recent years, the values for indicators of reliability and the service lives of airplanes, helicopters, aviation engines, and their assembly components have risen significantly. The diagnostic and reliability laboratories of the large

aviation technical bases are now collecting, processing, and analyzing data on the causes of malfunctions. In addition to enlarging the number of these subdivisions we must improve them by providing them with automated data processing equipment and, in the future, move to a unified automated reliability control system. Such a system is being developed by specialists at the Vnukovo Production Association and the Riga Institute of Civil Aviation Engineers on an experimental basis. Another paramount task is to establish norms for levels of reliability of the parts of aviation equipment.

Conserving fuel and lubricants plays a special part in improving the economic indicators of the use of aircraft. Expenditures for fuel and lubricants are almost one-third of the prime cost of air conveyance. It was not accidental that the 26th CPSU Congress gave the workers of civil aviation this task: "Take steps to significantly reduce the expenditure of fuel by rational operation of aviation equipment, reducing fuel losses, raising engine economy, and improving the weight and aerodynamic characteristics of airplanes and helicopters."

With the goal of performing this task Comrade B. P. Bugayev, minister of civil aviation, ratified a program of aviation fuel conservation for 1981-1985 and a set of additional measures for rational use and conservation of raw material, fuel-energy, and other material resources. The program envisions continued introduction of new and modified aviation equipment with lower figures for specific fuel expenditure. For example, use of the Il-86 and Yak-42 aircraft makes it possible to significantly reduce fuel expenditure per unit of transportation output. Work is underway to increase the passenger capacity of the aircraft in operation and provide them with new, more economical engines.

Improving the flight and technical operation of airplanes and helicopters offers substantial reserves. Above all this means introducing optimal flight regimes using onboard optimization systems, automation of air traffic control, and broad use of automated navigation calculations. Recommendations have been worked out to reduce cruising speed and work is underway to employ optimal centering and taking off with lower angles of deflection of the flaps, with engines working in the nominal regime, taking into account take-off weight, atmospheric conditions, and the characteristics of the runway.

Improving the processes of technical operation and repair of aviation equipment can provide a significant fuel savings. There are significant reserves here in reducing the length of monitoring-testing flights, cutting time spent for adjusting and testing engines, careful adjustment of the assemblies of the fuel system, automating the adjustment and testing processes, and improving the quality of ground monitoring of repaired and serviced systems. Some useful experience has been accumulated in these areas, in particular at aviation repair plant No 407 and the aviation technical bases of the Vnukovo Production Association and the Tolmachevo Aviation Enterprise.

An important factor in conservation is collecting so-called secondary resources: fuel sediment, used lubricants, and used special fluids. They can be recycled to their primary use, used in ground installations, or for regeneration. At the Tolmachevo Aviation Enterprise, for example, consumption of

B-70 gasoline for washing parts and assemblies has been cut to less than one-third of the norm by multiple filtration and recycling.

Civil aviation enterprises are doing a great deal of work within the framework of the All-Union public inspection for efficient use of fuel-energy resources and raw and processed materials. For example, last year the employees of aviation repair plants alone offered several thousand suggestions that made it possible to save more than 6 million rubles. Every socialist obligation of aviation workers, beginning from general sectorial obligations and going down to individual obligations, envisions concrete steps to conserve fuel-energy resources and raw and processed materials.

Unfortunately, this work is poorly organized and done in a formalistic manner. Serious shortcomings in the use of aviation and motor vehicle fuel were recently discovered by the USSR People's Control Committee during an inspection of plans Nos 400 and 402. A number of enterprises permit large above-plan remainders of material assets and uninstalled equipment (for example, the Magadan, Tyumen, Turkmen, and Moscow transportation administrations). The main reasons for the formation of surpluses of material resources are incorrect determination of need for them and the endeavor of certain managers to establish increased supplies "just in case." This results in large losses. Moreover, we also find careless storage of material assets in the open air, which causes damage to them.

Significantly reducing above-norm remainders of material resources and uninstalled equipment is one of the conservation reserves. It must be emphasized that this is a concern not just for material-technical support workers but all the managers of enterprises and organizations in civil aviation.

The increasing need of the national economy for air shipping leads to a constant increase in the intensity of air traffic. This demands development and introduction of the latest automated air traffic control systems which make it possible to reduce the load on air traffic controllers, increase the traffic capacity of air routes, and cut the time spent by aircraft in waiting zones. In other words, it means to improve the regularity and economy of flights. Experience with the use of the first such systems showed that during the periods of greatest flight intensity the number of aircraft and time spent by them in waiting zones were reduced several-fold. Plans for the current five-year plan envision a broad program of construction and installation of automated air traffic control systems at new sites. The collectives of the Ukrainian, North Caucasus, and Volga administrations will have to work especially hard.

In recent years civil aviation airports have done a great deal to raise labor productivity and improve working conditions. New, effective means of ground mechanization have appeared. For example, new refueling trucks with capacities of 22 and 60 tons have been developed to speed up the refueling of aircraft. A refueling truck with a capacity of 90,000 liters is under development. Pulkovo airport is completing installation of the first domestic system of high-productivity centralized refueling.

Work is underway to improve mechanized means for cleaning runways and taxiways at airports. An airfield ice-removal machine with an infrared emitter has been

built. A unit to clean edges and flush lights has been put into use, as has a more economical wind machine developed by the experimental shop of the North Caucasus Administration. It is a self-propelled unit on the frame of a screw-rotary cleaning machine.

Airports are making broad use of six-ton container trucks to accelerate the loading and unloading of containers for the Il-76T aircraft. This year experimental plant No 85 will rig up 10 such container trucks. A frequency transformer will go into use which will make it possible to improve the quality of testing aircraft electrical equipment.

The efficiency of work in the sector is determined to a significant degree by the organization of repair work on aviation equipment. Large-scale operation of high-speed, multipassenger aircraft and the broadening use of heavy helicopters equipped with complex systems in the national economy demanded an expansion of the production base of aviation repair plants. Shops and sections are installing modern equipment and making broad use of scientific and technical advances. We can gage the scale of technical re-equipping by these figures: the construction of new buildings and equipping of plants in the 10th Five-Year Plan made it possible to increase the total volume of aviation repair production by 50 percent. The volume of production for repair of Il-62 aircraft tripled, while repair production for Tu-134 aircraft and gas turbine engines doubled. The time spent by aircraft in repair was reduced by more than two-thirds.

Aviation repair workers face challenges of equal scale in the 11th Five-Year Plan. Production capacities are to be greatly enlarged in the Far North, Siberia, and the Far East and efforts will be made to meet the sector's need for repair of aviation engines. The existing system of plants needs further refinement and expansion. We must incorporate facilities to repair large-thrust engines and the engines of new aircraft coming into use. New technological processes such as plasma and detonation spraying, electron beam and pulsed welding, and the use of lasers, are receiving broad application.

But there are also still a number of complaints to be made against repair workers, above all as to the time and quality of repair work. At present not all plants are fully meeting the needs of operating enterprises for repaired aviation equipment. The primary plan indicators of the repair plants need revision.

While devoting proper attention to development of the sector's production base, it is important not to forget that ultimately success depends on the human being who operates the latest aviation equipment and insures its uninterrupted work. The human being, the main link in the whole chain, determines whether a good final result will be achieved or not.

Our sector is rightly proud of its production leaders and true masters of their work. Many of them are employed in aviation engineering services and at repair plants. The high quality of technical servicing of aircraft provided by engineers and technicians of the Belorussian and Komi administrations and the Central Administration of International Air Communications deserves praise. Highly sophisticated production work and exemplary maintenance of work positions

are a distinctive characteristic of the sections and shops of the aviation technical bases of the Leningrad and Domodedovo aviation enterprises. Progressive labor methods have found broad application at Mirnyy, Ukhta, and Strezhevoy airports.

A specialist who loves his work does not limit his activity to the narrow confines of plan assignments. The movement of inventors and efficiency workers and their initiative are a great help in intensifying aviation production. We have entire collectives who have firmly established their reputations as creative workers. Among them are the collectives of aviation repair plants Nos 407, 410, 411, and 243, the aviation technical base of Sheremet'yevo airport, and many others.

New, complex aviation equipment imposes high requirements on the qualifications of flight and engineering-technical personnel. Many enterprises today operate training and training methods classrooms equipped with models, displays, simulators, procedure trainers, and other technical training aids. More and more training classrooms are being built at industrial enterprises. The collectives of the Kirov, Kharkov, Rovno, Novgorod, and other aviation enterprises have made the greatest advances in preparing training facilities.

Employees of the sector's enterprises and organizations are laboring in an atmosphere of great political and labor enthusiasm. This is illustrated, specifically, by the broad socialist competition for the honorary titles of best service, shop, and brigade and the campaign to make Aeroflot the standard to be measured against in transportation. Competition has engulfed all the collectives of the aviation technical bases, aviation repair plants, and scientific institutions. The resolutions of the May 1982 Plenum of the CPSU Central Committee, the report by Comrade L. I. Brezhnev added, and the comprehensive USSR Food Program approved by the Plenum have aroused a new upsurge of political and labor activism among aviation employees. This unified desire to strive for greater results today than yesterday is a guarantee of a continued rise in the efficiency and quality of work.

Great and important tasks are to be accomplished in all elements of our complex aviation transportation system. The foundation of success here is determined largely by operational implementation of all the reserves at the disposal of the sector and by continued accelerated development of its material base.

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AIR

CONSERVING AVIATION FUEL BY SHIFTING CENTER-OF-GRAVITY POSITION

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 8, Aug 82 pp 26-27

[Article by S. Skripnichenko, department head GosNII GA (State Scientific Research Institute of Civil Aviation), candidate of technical sciences, and A. Fedchenko, senior project engineer, GosNII GA: "With Optimal Center-of-Gravity Position"]

[Text] One of the reserves for conserving fuel is reducing fuel expenditure by introducing the recommendations on the influence of balancing on the aerodynamic efficiency (lift-to-drag ratio) of aircraft developed by GosNII GA together with organizations of the Ministry of Aviation Industry.

It is common knowledge that in a cruising regime air dynamic efficiency determines the magnitude of fuel expenditure. This is easy to ascertain because per-kilometer fuel expenditure (q_{km}) is inversely proportional to aerodynamic efficiency (K):

$$q_{km} = \frac{C_e G}{KV}.$$

where C_e is specific fuel expenditure, G is the flying weight of the aircraft, and V is the air speed of flight. Aerodynamic efficiency itself is the ratio of the airplane's lift (Y) to the force of drag (X) or the ratio of their coefficients ($K = C_y/C_x$). At set flying altitude and speed the coefficient of lift is proportional to flying weight. But the coefficient of drag (for a given value of the lift coefficient) depends on deflection of the stabilizer and elevator. The greater these deflections, the greater the drag coefficient will be, which also means the greater fuel expenditure will be.

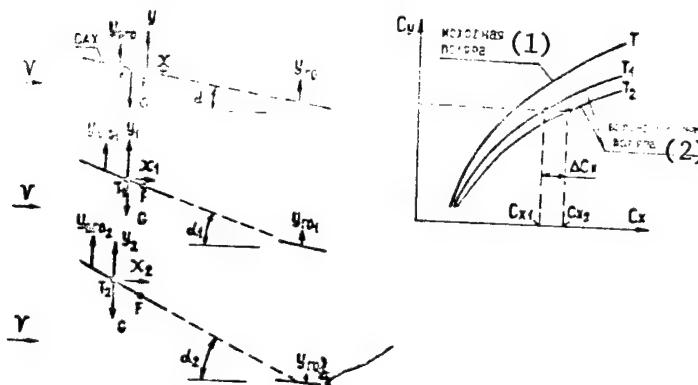
Balancing the plane in flight can noticeably increase the induced drag, that is, the drag caused by the presence of lift. It is produced by a certain deflection of the stabilizer or elevator from the zero position. In this case the lift of the horizontal tail decreases and even becomes negative. This in turn leads to a decrease in the induced drag of the horizontal tail (as the result of a reduction in its local angle of incidence). But in this case to preserve the airplane's lift it is necessary to increase the plane's angle of incidence, which increases the drag of an airplane without a horizontal tail. The total effect of the influence of both of these factors on the drag polar of the plane, that is the relationship of the lift coefficient and drag ($C_y = f(C_x)$), is

usually unfavorable: the balance drag polar (considering deflection of the controls) is located to the right of the drag polar of an aircraft with its initial unbalanced configuration. (Figure 1 below gives a schematic representation of a comparison between the balance drag polar and the initial, unbalanced one).

Figure 1. Effect of Center-of-Gravity Position
on Increase in the Drag Coefficient

$X_T > X_{T_1} > X_{T_2}$ — distance of c.g. from leading edge of MAC
 $\alpha < \alpha_1 < \alpha_2$ — aircraft angle of incidence
 $Y_{BGO} < Y_{BGO_1} < Y_{BGO_2}$ — lift of airplane without horizontal tail

$Y_{go} > Y_{go_1} > Y_{go_2}$ — lift of horizontal tail
 $Y = Y_1 = Y_2$ — lift of airplane
 $X < X_1 < X_2$ — drag of airplane



Key: (1) Initial Drag Polar;

(2) Balance Drag Polar.

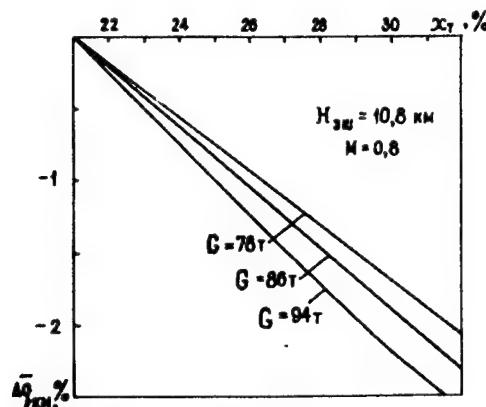
But what are the factors on which growth in drag depend?

The effect of balancing on growth in drag depends above all on the static (longitudinal stability) margin, which is determined by the position of the center of gravity (T) relative to the aerodynamic focus of the aircraft (F) and is measured in fractions of the mean aerodynamic chord (MAC) of the wing.

The smaller this margin is, the closer the center of gravity will be to the center. And this means that the airplane will have a smaller deflection of the stabilizer (or control surface) needed for balancing. As a result, it will be balanced at a smaller angle of incidence, which ultimately leads to a decrease in the drag coefficient by the quantity ΔC_x and correspondingly to a decrease in fuel expenditure Δq_{km} proportional to ΔC_x . (Figure 1 gives a schematic picture of the redistribution of aerodynamic forces on the wing and horizontal tail when the airplane is balanced and the center of gravity is shifted.)

Theoretical studies made at GosNII GA establish that it is possible to conserve fuel by reducing losses of aerodynamic efficiency to balancing with use of rear center-of-gravity positions in the permissible range of change. Figure 2 below shows the typical change in per-kilometer fuel expenditure in percentages of the initial value depending on the c.g. position of a Tu-154B plane. The calculations show that shifting the center of gravity back by one percent of the MAC reduces fuel expenditure in horizontal flight by 0.25 percent for the Il-62 and Tu-134A aircraft, by 0.20 percent for the Tu-154B, Il-86, and Yak-42 aircraft, and by 0.10 percent for the Yak-40. These figures are averages for different flight regimes. The effect of shifting the c.g. position on fuel

Figure 2.



expenditure is more significant with large flying weights, high flight levels, and lower flying speeds (M numbers).

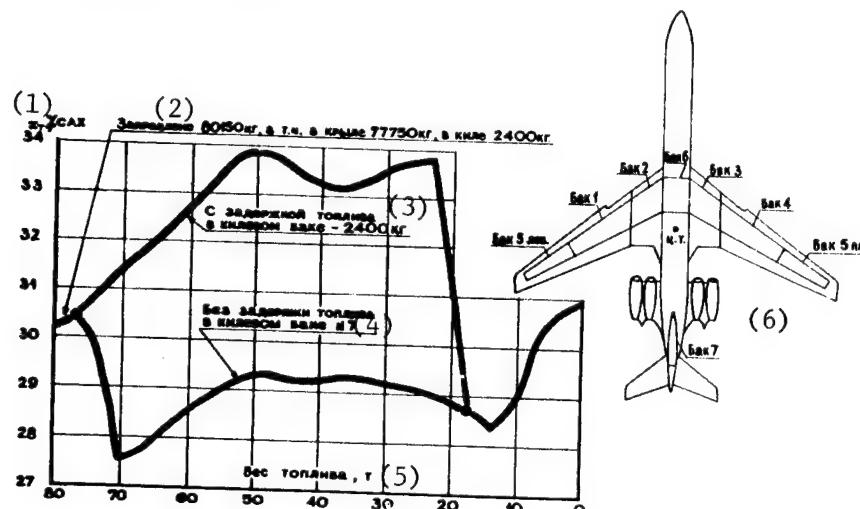
What is the actual fuel conservation for flights with the c.g. position shifted back?

On the basis of flight tests it has been established that a flight of 2,000-3,000 kilometers by the Tu-154B with maximally rearward c.g. position compared to the average operating position produces a savings of 80-120 kilograms of fuel (even if the stabilizer is not in the optimal position). The same flight by a Tu-134A for a distance of 1,800-2,400 kilometers at the optimal flight level produces a savings of 110-150 kilograms of fuel.

The fact that the Il-62M aircraft has a fin-mounted tank of substantial length relative to the center of gravity makes it possible to influence the c.g. position directly during the process of flight. For the purpose of introducing the results of theoretical calculations in operation GosNII, together with TsUMVS [expansion unknown] conducted an operations test on the Moscow-Tokyo-Moscow

route to determine the potential for fuel savings on an Il-62M with a rear-mounted fin tank. Comparative flights were planned, one taking fuel from the fin tank at the site of the flight while maintaining a proven speed of $M = 0.79$ and the other delaying use of fuel from the fin tank and employing the most advantageous flight programs. (The nature of change in c.g. position in both cases is shown in Figure 3 below.) When use of fuel from the fin tank was

Figure 3. Nature of Change in Center-of-Gravity Position Relative to Delaying Use of Fuel from Fin Tank of Il-62M Aircraft (Center-of-Gravity Position of Aircraft Without Fuel 31 Percent of MAC).



Key:

- (1) MAC, %;
- (2) Fuel Supply 80,150 Kilograms, including 77,750 in wings and 2,400 in fin;
- (3) With Delay of Fuel in Fin Tank, 2,400 Kilograms
- (4) Without Delay of Fuel in Fin Tank;
- (5) Weight of Fuel, tons;
- (6) [Diagram shows positions and numbers of fuel tanks; two No 5 tanks, right and left].

delayed in cruising flight the c.g. position was close to maximally rearward ($\bar{X}_T = 33\text{-}34$ percent of MAC), whereas when fuel from the fin tank was used immediately after takeoff the c.g. position was in the 28-29 percent of MAC range. The essential information on flight parameters was recorded on special blanks filled out by the flight engineer during flight; they were also recorded by MSRT-64 equipment on magnetic tape.

The tests showed that when rear c.g. positions are used together with maintaining optimum regimes the per kilometer fuel expenditure is cut by an average of 1.5 percent compared to the figure for average operating c.g. positions. In this case the angles of deflection of the stabilizer are decreased by 0.7 degrees. Fuel expenditure for the paired flight was reduced by more than

2,000 kilometers. This demonstrates the superiority of flying with rearward c.g. positions from the standpoint of fuel economy.

On the basis of the studies appropriate recommendations on flights with rearward c.g. positions were given in manuals on flight operation of aircraft and instructions on loading and c.g. position. It should be said that there is a fully certain value of the lift coefficient of the horizontal tail that corresponds to each flight regime and each c.g. position. This lift coefficient can be obtained both by deflecting the entire stabilizer and by deflecting the stabilizer and elevator at the same time.

In addition, wind-tunnel studies that were conducted showed that for most aircraft which have symmetrical horizontal tail profiles the minimum aircraft drag (considering balancing) is achieved with a zero position of the elevator, that is, balancing of the longitudinal moment is best accomplished by the stabilizer alone. While flying, therefore, it is advisable to select the position of the stabilizer for Rl-62 or Tu-154 aircraft so that the elevator is in the zero position. If the drag polar of the horizontal is asymmetrical the minimum drag does not necessarily correspond to the zero position of the elevator.

To insure the maximum aviation fuel conservation in new aircraft it is advisable to install automatic balancing systems that make it possible to set the stabilizer and elevator in the optimal positions automatically for minimum drag in different flight regimes.

At first glance it would seem advisable on many aircraft to modify the stabilizer (the shape of its leading edge, its shape in plan, sweep, and area) to reduce balance drag, and this would also reduce per-kilometer fuel expenditure.

To insure the required c.g. position it is very important to determine the optimal alternative of loading the aircraft on the ground. This process must be automated for large shipping volumes. Thus, a new experimental system that automatically calculates the c.g. position is undergoing operations testing at Vnukovo airport. The system makes it possible, based on actual loading (taking into account hand luggage, service passengers, children, and other factors), to quickly determine the optimal alternative for arrangement of passengers in the compartments and for arrangement of freight, luggage, and mail. The operation of calculating alternatives is done in advance according to the number of tickets sold and the presence of freight and mail. Then it is finally determined after the passengers register. The advantages of this automated system over traditional graphic methods of calculating c.g. positions are already obvious.

It is advisable to broaden the range of operations c.g. position rearward to increase the fuel efficiency of civil aircraft. This can be introduced in practice only if automatic longitudinal control systems are used.

Among the steps involved in reducing expenditure of aviation fuel by reducing losses of aerodynamic efficiency to balance, we cannot fail to mention the promise of using onboard systems to determine takeoff weight and c.g. position. These systems, based on measurements of forces and pressures in the struts (shock absorbers) of the fuselage, make it possible to insure precise loading to

create the assigned optimal c.g. position and takeoff weight. In addition, the systems make it possible to insure complete operating safety, above all because they do not permit the actual weight to exceed permissible weight or the actual c.g. positions to go outside the permissible range for all possible variations of commercial loading.

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AIR

AVIATION REPAIR ASSOCIATION CHIEF INTERVIEWED

Moscow VOZDUSHNYY TRANSPORT in Russian 17 Jul 82 p 2

[Interview with Yevgeniy Nikolayevich Kitov, chief of the All-Union State Industrial Association "Aviaremont," by M. Gasanaliyev: "And the Machines Go Out Again on the Routes"; date and place not given]

[Text] Repair signifies a saving of labor, physical and other resources invested in an article and a guarantee of the possibility of its prolonged use.

"... Something which seems simple and very everyday--a thrifty attitude toward public property and the ability to make full and purposive use of everything that we have--is becoming the pivot of economic policy," Comrade L. I. Brezhnev, general secretary of the CPSU Central Committee, said at the 26th CPSU Congress.

Collectives of aviation repair plants in civil aviation, which are part of the All-Union State Industrial Association "Aviaremont," have successfully completed the first year of the 5-year plan and the plan for 6 months of the current year. This association has been in existence for 10 years now. In that time it has acquired a certain experience, has outlined ways for further economic and social development of the association, and has lengthened the life of airplanes, helicopters and engines. Our correspondent interviewed the association's chief, Ye. Kitov.

Our Interview

[Question] Yevgeniy Nikolayevich, in what direction is the activity of civil aviation plants developing?

[Answer] Aeroflot's fixed productive capital is its fleet of passenger, cargo and specialized airplanes and helicopters, which year after year is experiencing quantitative growth, while its qualitative characteristics are changing rapidly. Aviation equipment which has been absorbing the best achievements of scientific-technical progress, is becoming increasingly sophisticated.

Aviation equipment, like any other equipment, wears out during operation and needs to be restored. This is what our plants do. In making repairs, they completely restore performance of the aviation equipment, which by virtue of

the specific nature of its operation requires more than any other transportation equipment constant attention to its technical condition, full and timely performance of repair and maintenance, and modernization in order to improve its reliability. These peculiarities and tasks are the point of departure for development of the plants of the civil aviation system.

[Question] What tasks do the civil aviation plants confront in the 11th Five-Year Plan?

[Answer] Aeroflot has planned a sizable growth of the volume of passenger and cargo traffic and also other types of aircraft operation, which makes it necessary to increase the volume of repairs by approximately 28 percent over the 10th Five-Year Plan.

In order to cope with the increase in the volume of work and at the same time to master the repairs of new and more sophisticated aviation equipment coming into service in recent years, the organization of repair work needs to be improved, and new technological processes mastered and introduced. Such processes as ultraviolet pulse drying of coats of paint and varnish, detonation spraying of metal on engine vanes, plasma spraying of parts in vacuum chambers, and many other methods.

There is also a need to expand introduction of electronic computers into the technological processes of repair and the testing of aviation equipment before it is returned to aviation enterprises.

On the basis of the decisions of the 26th CPSU Congress and plenums of the CPSU Central Committee on converting the economy to the intensive development strategy, there is a need for more optimum use of production potential and for guaranteeing a full-fledged economy in the use of all resources and improvement of the quality of work.

[Question] Obviously the growth of the volume of work and the assimilation of new technology require an increase in plant capacity. What sort of development will the plants undergo in the period up to the year 1990?

[Answer] The present accelerated construction and activation of capacities represent one of the most urgent tasks in development of aviation repair and in improvement of its efficiency. The amount of construction and installation work planned for the association is 2.6-fold greater than the volume in the 10th Five-Year Plan. This is the first time that construction on such a scale has been undertaken at civil aviation plants.

Specific tasks have now been defined for development of the individual plants, and the principal ways of accomplishing them have been outlined. The principal ones are completing construction projects begun earlier, guaranteeing maximum development of capacities for repair of aviation engines and helicopters, and erection of buildings of lightweight metal fabrications. It is our duty to successfully fulfill plans and obligations we have assumed within the period of time allowed. The results of 1981 instill hope that that will in fact be the case. Over the past year 25 projects for production purposes and housing with an area of 26,000 square meters have been built and put into service.

Aviation repair personnel face crucial tasks in connection with the decisions of the May (1982) Plenum of the CPSU Central Committee. We have discussed specific measures to guarantee a solid contribution of aviation repair plants to fulfillment of the Food Program with directors of the plants in the directors' council. Conferences are now being held of the party and economic aktiv at our various enterprises in which a management team of "Aviaremont" is participating; at those meetings the decisions of the plenum of the CPSU Central Committee are clarified and explanations are given of the tasks which civil aviation minister B. P. Bugayev has set for the personnel of the sector. Measures are being outlined to perform them.

Unconditional fulfillment of the plan for repair of aviation equipment, especially airplanes and helicopters used in agriculture, modernization and manufacture of agricultural apparatus and equipment to mechanize the servicing and maintenance of aircraft of PANKh [Fleet of Aircraft in the National Economy] will be our first contribution to carrying out the USSR Food Program.

Provision has been made to increase the aid rendered to sovkhozes and kol-khozes under our patronage in the production of farm products and in building livestock farms and other projects.

Much attention will be paid to development of subsidiary farms and agroshops at our plants. There are now subsidiary farms at seven of the association's plants. In 1981 they produced 450 tons of grain, 50 tons of meat, 9 tons of vegetables, and 25,000 eggs. This is a good addition to the table of aviation repair personnel.

A comprehensive plan for economic and social development and also a target program for improving the quality of repairs were drafted in the association for the 11th Five-Year Plan. These documents resulted from summarization of the experience of party and trade union organizations and of the management of the plants during the 10th Five-Year Plan and of a thorough study of the tasks facing the collectives of enterprises.

The results of work in the first year of the 11th Five-Year Plan indicate the correctness of the choice of directions in the comprehensive plan and in the target programs.

[Question] What are the ways for further improvement of the efficiency of aviation repairs?

[Answer] As I have already said, as the equipment being repaired becomes more complicated and higher standards have to be met concerning its reliability, the requirements for increasing the efficiency of production and for economizing on all types of labor and physical resources are not lowered. This will be achieved through the improvement of the economic mechanism being carried out at the plant and through introduction of normative net output and production cost into planning as performance indicators.

The problems of rebuilding individual parts and assemblies of airplanes occupy a solid place in performing these tasks, since the cost of spare parts is a

sizable portion (about 50-60 percent) of repairing the piece of equipment. But the cost of "reviving" a part that has been used does not exceed 10-25 percent of the original cost.

Contemporary science is proposing new methods of restorative repair. We are applying them in production. Programs drafted at the civil aviation plants on the basis of the target program compiled in the association for expanding the product list of rebuilt parts and types of part repairs at civil aviation plants in the 11th Five-Year Plan include about 250 types and sizes of expensive components.

The association's efficiency experts and inventors are making a large contribution to increasing efficiency and boosting production. During the last 5-year period 28,500 innovative proposals were applied and yielded a saving of 33.6 million rubles. In all, 236 patent applications on inventions were filed.

Even now we see the need to orient our work toward scientific-technical development of the repair network and toward a close relationship between science and aviation repair. For example, GA [Civil Aviation] Plant No 402 and KII GA [Kiev Industrial Institute of Civil Aviation] have been conducting joint projects on gas-thermal methods of applying coatings, GA Plants Nos 410 and 243 and MII GA [Moscow Industrial Institute of Civil Aviation] have been doing joint work on diffusion coatings. Much depends on scientific research and other institutes in conducting joint projects with production people to increase intervals between repairs and to extend the service life of pieces of equipment and units.

[Question] In practical terms how is the relationship being established between science and production?

[Answer] Unfortunately, these relations are not strong enough at present. Creation of scientific research subdivisions and a department oriented specifically toward repair topics within the State Scientific Research Institute of Civil Aviation and assignment to them of the functions of keeping up with repairs on all types of equipment--that is the way to centralized management of scientific-technical development in the repair system. And the potential does exist for further improvement of the reliability of aviation equipment and the efficiency of repair work.

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CSO: 1829/289

AIR

AVIAREMONT ASSOCIATION IN FIRST 6 MONTHS OF 1982

Moscow VOZDUSHNYY TRANSPORT in Russian 24 Jul 82 p 1

[Text] The workers of the All-Union Association "Aviaremont" made their contribution to attainment of high production indicators of civil aviation in the first half of 1982. The overwhelming majority of plant collectives worked persistently to improve quality and to perfect the technology of repairing airplanes, helicopters and engines and they were persistent in introducing into the production process highly efficient and up-to-date forms of organization of work, advances of science and technology, and the proposals of production innovators and inventors. All of this has made it possible in the association as a whole to fulfill the 6-month plan for the products list. On the basis of normative net output the plan was fulfilled at a level of 103 percent, for the rise of labor productivity fulfillment was 102 percent. Production cost of products leaving aviation repair plants dropped 1.3 percent. In the association as a whole repair time was lower than standard time for most models of aviation equipment.

Among the progressive collectives of civil aviation's aviation repair plants were Plant No 400 (director V. Sladkov), No 407 (director A. Yamov), No 410 (director A. Kudrin), No 403 (director P. Volokitin), No 404 (director A. Padarov), No 20 (director V. Pinchuk), No 21 (director B. Dmitriyev), No 406 (director G. Slesarevskiy), and No 73 (director V. Kalinochkin).

Civil aviation's experimental plants coped successfully with fulfillment of the 6-month plan for the products list. At Experimental Plant No 409 (director V. Chaplygin) 650 devices for filling tanks with liquid chemical poisons were manufactured by 1 July for the association "Sel'khoztekhnika." At Experimental Plant No 425 (director V. Kalinin) very scarce parts and assemblies were manufactured for agricultural equipment on the An-2 airplane in the total amount of 150,000 rubles. In the second quarter the program was completed to supply equipment to 20 airports for container mechanization for the Yak-42 aircraft.

But not all collectives coped with their 6-month assignment. The plan for the products list was not fulfilled at the following civil aviation plants: No 243 (director N. Zakharov), No 24 (director R. Silant'yev), No 41 (director N. Vayda). At Plant No 24 the plan was not fulfilled for normative net output, and labor productivity did not rise sufficiently. As in the past, the repair time on airplanes was intolerably long at Plant No 243.

Taking into account past shortcomings, these collectives have to direct the efforts of workers toward unconditional fulfillment of production plans and toward raising the level of organization and technological discipline. The effort to achieve quality and to meet repair schedules, to achieve reliability of the renewed aviation equipment, and ultimately to achieve flight safety--that is what will determine the work of aviation repair personnel in the third quarter of the current year.

7045

CSO: 1829/289

AIR

ROLE OF IL-76T IN CARGO DELIVERIES FROM JAPAN TO EUROPE

Moscow VOZDUSHNYY TRANSPORT in Russian 26 Nov 81 p 3

[Article by V. Gurdzhiyants, senior engineer in the department of international shipping of the Administration of Organization of Shipping of the Ministry of Civil Aviation, under the rubric "Use Fuel More Efficiently": "Vladivostok — Luxembourg: Cargo Bridge on the Il-76T"]

[Text] Our Vladivostok enterprise has accumulated interesting and useful experience with use of the Il-76T aircraft and coordinating the work of air, vehicle, and maritime transportation to ship cargo in containers. For some years now this enterprise, together with the Central Administration of International Air Communication, has been working on shipment of international cargo between Japan and points in Europe across the USSR by a mixed air-sea route. Japanese companies doing business with countries of the Middle East and Western Europe have learned that the Transiberian air highway is many times shorter and faster and works more reliably than the sea route across the Indian Ocean. That is why the flow of cargo containers from Japan is steadily growing. Last year, for example, the seaports of the Far East processed 380,000 export containers.

The mixed air-sea cargo line consists of the following segments: sea (Yokohama to Nakhodka); land (Nakhodka to the Vladivostok airport); and, air (Vladivostok airport to Moscow and to points in Europe). Cargo is sent on Il-76T aircraft to Luxembourg in particular.

The average time of cargo delivery from Vladivostok to Luxembourg is about eight hours, which is much faster than by sea or by rail. It is this advantage that makes the mixed air-sea line so popular. Further evidence of this is seen in the constant growth of the volume of container shipping. Thus, in June 1979 about 100 tons of expensive express cargo was sent from Japan to Europe; in the same month of 1981 more than 615 tons was shipped by this "air cargo bridge."

Unfortunately, the cargo storage area and facilities available in Vladivostok and its cargo-handling equipment leave much to be desired. But efficient use of available equipment has helped reduce loading time for the Il-76T from 5-6 hours to one hour and 40 minutes.

In order to avoid cases where cargo is reloaded from one container to another at the airport workers of the service have adopted a new technology for trips by

the Il-76T between Vladivostok and Luxembourg. At the airport sea containers carrying cargo for Luxembourg are put together on the Luxembourg loading ramp. Because the available machinery (the PPK-5 trailer-type container lift truck and CK-5A and PKS-5 container carts) are not suitable for 10-ton containers, workers of the service made a special trailer cart which is pulled by a KrAZ-2 aircraft tractor. But the limited area of the parking places prevented the tractor from maneuvering freely with a container on the cart. Furthermore, loading and unloading with this technology took 2-3 hours. Then the body of the KrAZ aircraft tractor was modified to carry sea containers. The entire operation began to take slightly more than one hour. (And if a lift truck with a load capacity of 10-12 tons is used the cargo handling time can be cut by an additional one-half). Furthermore, the warehouse is successfully using other machinery, the Balkan lift truck and an autoconveyor.

The working plans of the Vladivostok mail and cargo service include new measures to improve the work of the mixed air-sea cargo line. They plan to change the parking place of Il-76T aircraft at the airport to bring them closer to the container areas. A rail line will be laid from the sea and air container ramps to the aircraft parking places and a container cart will travel along it. The containers will be loaded onto it by a truck crane and lift truck with load capacities of 10-15 tons. Some modifications of the system for tying down aircraft are contemplated and the securing devices for sea containers in the aircraft have been changed. In short, work to select technological processes and technical means for receiving and shipping cargo in a thoughtful way is continuing. Stepped-up socialist obligations have been adopted for the 11th Five-Year Plan. F. Pazin, head of the service for organization of mail and cargo shipping of the Vladivostok airport, V. Zhuravleva, dispatcher at the commercial warehouse, A. Budnikov, leader of the brigade of loading workers, experienced production leaders V. Kolganov and I. Ivanov, and others are filled with determination to carry out the plans and fulfill their lofty obligations.

11,176
CSO: 1829/332

MOTOR VEHICLE

AUTOMATION EQUIPMENT IN AUTOMOTIVE INDUSTRY SURVEYED

Moscow AVTOMOBIL 'NAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 21-23

[Article by V. F. Rzhevskiy, candidate of engineering sciences, NIIavtoprom [Scientific Research Institute of the Technology of the Automotive Industry]: "Up-to-Date Equipment--The Basis of Scientific-Technical Progress"]

[Text] Present-day motor vehicle manufacturing is characterized by extensive use of specialized equipment--high-output automatic machines, automatic production lines and systems, which perform an entire set of processing, auxiliary and transport operations. This equipment is developing along various lines, the main ones of which are improvement of the present designs and creation of new ones based on more progressive manufacturing processes and methods of machining motor vehicle parts. Example of this might be the foundry at KamAZ [Kama Motor Vehicle Plant], for automatic production lines equipped with core stackers, automatic filling devices, special systems for preparing the mixture and automatic mixture feeding are used in making castings.

There and at many other enterprises in the branch foundry work will be further automated, the volume of production will be expanded and the number of products obtained by powder metallurgy will be increased. According to calculations, expansion of present powder metallurgy sections and creation of new ones using automatic presses (Figure 1) and flow-through furnaces (for sintering the powders) make it possible to reduce by almost 30 percent the labor required to manufacture 1 ton of cermet parts.

Many other production operations in the branch's enterprises contain large unused potential. For example, the use of flow-through automatic machines (Figure 2) and equipment furnished with systems for automatic regulation of processes increases the service life of parts 20-30 percent in heat treatment and thermochemical treatment. In the branch's forging and stamping (its share is more than 25 percent of the entire volume of forgings made in machinebuilding) there are plans to introduce automated complexes on the basis of KGShP [crank-operated hot-stamping presses] and GKM [horizontal forging machine] with automatic devices for advancing the workpieces, and also automatic hot-stamping machines with new equipment for induction and gas heating of the workpieces. All of this, combined with mechanized movement of materials and various loading devices (industrial robots, manipulators) will make it possible to raise productivity and improve working conditions in forge shops.



Figure 1

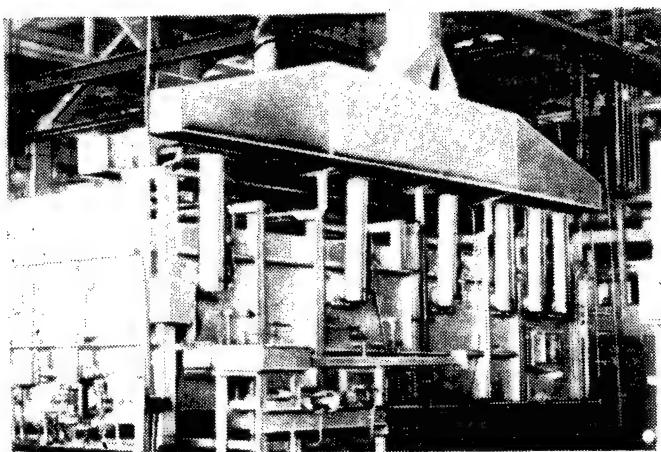


Figure 2

In the 11th Five-Year Plan there was a considerable increase in the volume of production of parts by the method of drop forging, mainly thanks to the increase in the number of parts transferred to that process and the introduction of indexing presses, which noticeably increases the coefficient of utilization of the metal, reduces energy costs and eliminates a sizable number of job positions.

A new step is being taken in the production of workpieces--accuracy and quality of workpieces are increasing. This will be furthered by the continued introduction of rotary-wedge rolling, KGShP, automated GKM, automatic hot-stamping machines, automatic stamping complexes and power upsetting lines. Experience at VAZ [Volga Motor Vehicle Plant], KamAZ, ZIL [Moscow Motor Vehicle Plant imeni Lenin], GAZ [Gorkiy Motor Vehicle Plant], at GPZ-1 [State Bearing

Plant No 1] and other enterprises has shown that such equipment makes it possible to reduce the total processing cycle in manufacturing parts, to raise labor productivity and ultimately to reduce metal intensiveness and labor intensiveness of motor vehicle production.

The metal-cutting equipment now being used at advanced plants in the branch is characterized as a rule by higher rigidity and precision, an automatic operating cycle, concentration of processing, and use of equipment for active monitoring and automation of the loading and unloading of parts. More than 70 percent of the equipment in the principal production operation, 80 percent of the automatic and semiautomatic machines and 90 percent of the automatic production lines are involved in machining processes. VAZ and KamAZ, where more than 90 percent of the equipment for machining metal operates in an automatic cycle, are having a definite impact toward improvement of the stock of equipment in the branch. The level of new equipment introduced in the 11th Five-Year Plan must at least meet the level of equipment installed at KamAZ in its productivity, processing capabilities and comprehensiveness. It should be selected and ordered on the basis of a standard line of the most progressive models, such as, for example, the new horizontal multispindle automatic lathe with expanded processing capabilities, automatic frontal lathes (Figure 3), broaches with two-way travel and multicenter grinding machines for grinding several surfaces or parts simultaneously, machine tools for power and high-speed grinding, multispindle honing and other machines making it possible to increase the productivity and accuracy of machining.

In recent years there has also been a considerable expansion of the number of parts machined on automatic production lines. Aside from the cylinder block and head, they are now used to machine crankshafts and camshafts, brake drums, wheel hubs, flywheels, disks, shafts and rods, crankshaft bearing cases and other parts. The new automatic lines have greater processing capabilities: They are used for boring, grinding, honing and broaching, heat treatment, assembly, removal of burrs and washing of parts. The lines are furnished with up-to-date control equipment that makes it possible to actively monitor the parts being machined and to diagnose the state of equipment and gear.

Further improvement of machine assembly requires broader use of adjustable automatic machines and automatic lines; whose technical level cannot be raised unless functional control systems are introduced to control their operation (programmable command units). Introduction of electronic control systems on the basis of programmable controllers will make it possible to rapidly reprogram production lines, which will in turn make it possible to reduce the time spent in readjusting equipment.

In welding work there are plans to continue the introduction of automatic multipurpose production lines for assembly and welding of principal motor vehicle assemblies (body understructure, side panels, doors, fuel tanks, driving axle housings, cabs, bodies, wheels and other parts); automatic and semiautomatic welding machines (spot, seam and arc) for work in a medium of protective gases, furnished with movable and indexing tables; special multielectrode machines for resistance spot welding built up from modules and making it possible to rapidly replace the welding dies when conversion is made to new models

or modifications of the assemblies being welded; adjustable machines for resistance welding of the sides of trailers, semitrailers and dump trucks in various modifications; industrial robots for welding cabs and bodies of automobiles and buses where these operations still involve manual work; automatic and semiautomatic setups for friction welding (Figure 4) to replace conventional welding methods (arc, butt and resistance). Broader use will also be made of new automatic and semiautomatic machines based on use of highly concentrated sources of energy such as the laser, plasma, electron beam, etc.

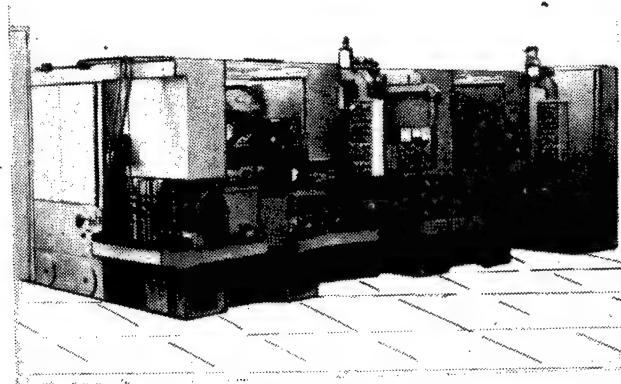


Figure 3

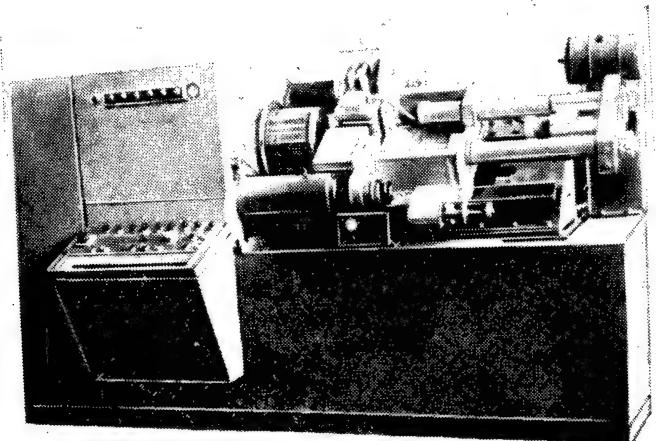


Figure 4

New galvanizing equipment will also be used: automatic lines with a rigid cycle, automatic loading and unloading of parts; ganged automatic loading lines of the drum type with programmed control, complete with a set of auxiliary equipment and the necessary monitoring devices and devices for washing with a stream and regeneration of electrolyte; automatic lines for galvanizing parts in drums (Figure 5) built from standardized assemblies.

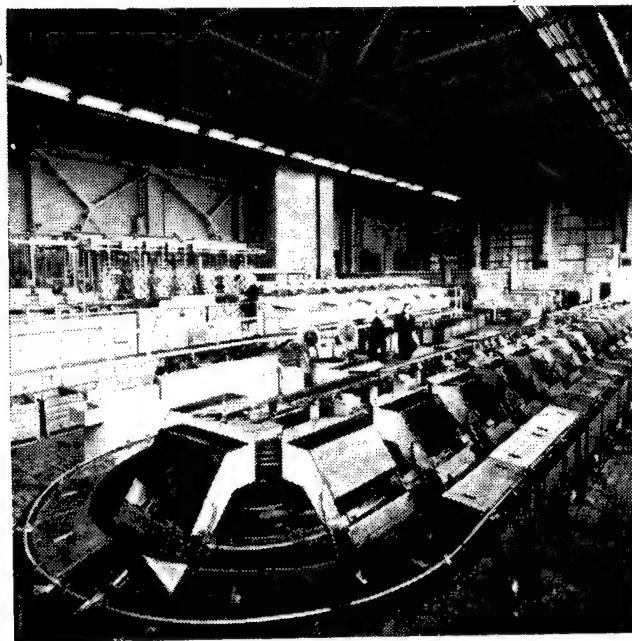


Figure 5

In painting broader use will be made of automated equipment for preparing the surface and for applying coatings by electroplating and spraying in an electrostatic field. One can illustrate by referring to the sets of machines for preparing the surface for painting which have devices for automatic filtration of grease-removing and phosphatizing solutions, remote heat exchangers and a system to protect conveyors from the effect of aggressive media; installations for painting by electric coating using a special system for filtration of the paint and varnish and devices for rapid mixing of the paint; installations for painting in an electrostatic field whereby the primer and paint are applied to assemblies and parts with complicated configuration regardless of the sequence in which they are fed on hangers; installations for applying powder paints in an electrostatic field using automatic rotary sprayers with an automatic system for paint recovery.

Improvement of assembly equipment will follow the line of creating automated assembly lines, including nonsynchronous lines with monitoring and specialized devices making it possible to select elements of compensating links; development and introduction of automatic manipulators with programmed control; introduction of automatic assembly stands, including rotating tables and computer control; creation of circular stations for assembly and testing of large-size assemblies and units; development of new methods of assembly and new assembly equipment based on use of the principles of whirlwind airflows, the power impact of an electromagnetic field, etc.; the equipping of assembly stations with calibrated power tools, dynamometric wrenches, monitoring and sorting devices and automatic monitoring and measuring devices.

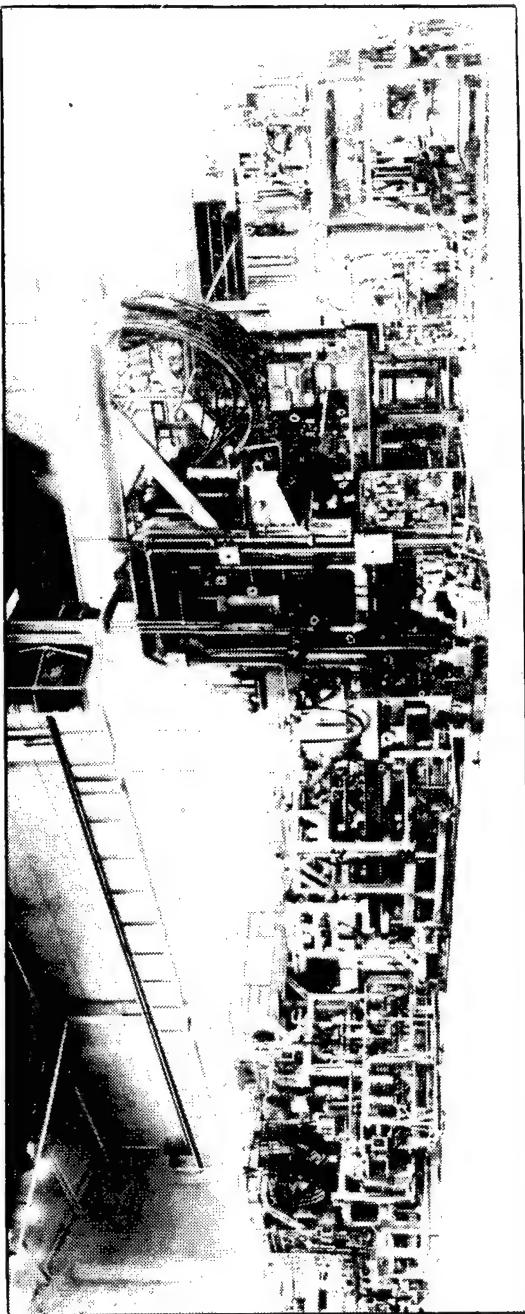


Figure 6

A basic peculiarity of equipment used in the branch is that it is specific. That is why a sizable portion of this equipment is and will be manufactured by the enterprises in the branch themselves. For example, in the years of the 10th Five-Year Plan the volume of its production increased eightfold; the problems of deliveries of painting, welding, assembly and galvanizing equipment were solved all at one time for the Krasnoyarsk Truck Trailer Plant, the Orsk Tractor Trailer Plant, and the Neftekamsk Dump Truck Plant; the problems of thermal and press equipment for the powder metallurgy shop of the Dimitrovgrad Automotive Assembly Plant imeni 50-Letiye SSSR; of welding equipment for

production of the VAZ-2121 and ZAZ [Zaporozhye Motor Vehicle Plant]-968; and an automatic shaping line was manufactured (Figure 6) for the Volga Motor Vehicle Plant imeni 50-Letiye SSSR, and production was begun on similar lines for other enterprises. Special types of processing equipment and gear were put into production since they are not manufactured by specialized ministries: in the production associations GAZ, KAZ and BelavtoMAZ--sheet-stamping presses combined with automation equipment with a force of 1,000-2,000 kilonewtons; in the production association VAZ--special one- and two-spindle multicutter automatic lathes arrayed to make up automatic production lines; and in the production associations Kommunar and GAZ--vertical shell and core machines, and so on.

It is advisable to use the capacities which have been created first of all to manufacture the specialized technical equipment which will make it possible to reduce energy costs and the size of the labor force and yield a substantial saving of metal.

In order to provide the branch up-to-date highly productive manufacturing equipment the system of monitoring orders for this equipment will be tightened, beginning with the stage of making up requests and correlating the technical assignments. This effort must prevent the ordering of equipment which is outdated in its design and technological features and whose use does not yield an appreciable rise in labor productivity.

It has been and remains a most important task in the national economy to furnish to motor vehicle production up-to-date, high-output and automatic equipment that determines future technical progress in development of technology. This task must be performed by the collectives of enterprises and scientific-research and design and process engineering organizations; and it must be performed just as required by the documents of the 26th party congress and the November (1981) Plenum of the CPSU Central Committee.

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1982

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CSO: 1829/304

MOTOR VEHICLE

UDC 629.113.(47+57)"1980-1985"

PRODUCTION PROGRESS, PLANS FOR VARIOUS PLANTS

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 8, Aug 82 pp 1-5

[Article by A. I. Titkov: "Motor Vehicle Technology in the 11th Five-Year Plan"]

[Text] "The 11th Five-Year Plan is a significant step in the further development of all the republics and in establishing the material-technical base of communism" (from the Decree of the CPSU Central Committee entitled "The 60th Anniversary of the Formation of the Union of Soviet Socialist Republics," dated 19 February 1982).

The automotive industry is one of the leaders of domestic machine building. It provides motor vehicles to virtually all the production sectors of the national economy: to mining, agriculture, industry, construction, trade, forestry, and others. In addition, the automotive industry concentrates production of roller bearings, lift trucks to mechanize loading-unloading and warehouse transportation jobs, almost half of the tractor trailers and semitrailers, more than half of the motorcycles, mopeds, and bicycles; electrical equipment and wheels used in many sectors of machine building; the engines for the K-700 and K-701 tractors, and many other assembly components. An important result of the work of the sector has been the well-known fact that the volume of motor vehicle shipping has risen about 1.3 times every five years and in 1981 80 percent of all national economic cargo was already being moved by motor vehicles.

A particularly large program of work was carried out in the 10th Five-Year Plan. Production volume rose 44 percent (in 1980 alone the Ministry of Automotive Industry produced more than 2,018,000 motor vehicles, including 744,000 trucks, 1,191,000 cars, and 83,500 buses), while labor productivity rose 34 percent and savings of metal were 11.6 percent. Forty-four obsolete models of motor vehicles were removed from production and about 100 new and modernized models and modifications were put into production. Among them were the ultramodern KamAZ [Kama Truck Plant] trucks and truck trains, the BelAz [Belorussian Automotive Plant] quarry dump truck with a load capacity of 75 tons, the LAZ-4302 diesel-powered city bus, the RAF minibus, the VAZ-2106 and VAZ-2105 cars, diesel trucks (ZIL-133GYa and Ural-4320) trailer equipment for KamAZ and ZIL [Moscow Automotive Plant imeni Likhachev] trucks made by the Stavropol and Krasnoyarsk truck trailer plants, tractor trailers to the K-700 and K-701 tractors produced by the Orsk Tractor Trailer Plant, and others.

In 1976-1980 the average load capacity of a transportation unit (considering trailers) rose from 5.1 to 6.2 tons while the total load capacity of production increased from 3.3 to 4.6 million tons, a rise of 30 percent. This made it possible to increase the average load capacity of a vehicle in the country's transportation fleet from 4.5 to five tons, thus reducing the specific expenditure of fuel 16 percent. At the same time the specific expenditure of rolled metal per ton of load capacities dropped from 603 to 540 kilograms and the service life of vehicles increased an average of 1.3 times.

One of the principal results of the work of the automotive industry in the 10th Five-Year Plan was the establishment of an industrial basis for large-scale introduction of diesel engines in trucks by introducing the capacities of the first and second phases of the Kama Truck Plant complex, which produced more than 280,000 trucks and truck trains and the diesel engines needed for them. As a result the proportion of diesel trucks in total motor vehicle production rose from 9.5 to 19 percent and the savings of motor fuel during the five years was about 15 million tons.

Organization of the production of motor vehicles by the Kama Truck Plant speeded up realization of a key technical development: accelerated production of truck trains for large-capacity shipping in place of single-unit vehicles of average load capacities. This increased the productivity of the truck fleet. Factory servicing of cars continued to develop and, for the first time, a factory system for repair and spare part supply of Kama Truck Plant trucks was organized.

Thus, in the 10th Five-Year Plan a strong foundation was laid for determining the main directions of development of the sector in the 11th Five-Year Plan.

These main directions of development are: a further rise in labor productivity; conservation of fuel, metal, and other materials; a decrease in the labor-intensiveness of technical servicing and current repair of motor vehicles; an increase in the service life of vehicles and engines and development of equal-strength design elements; and, raising the quality of all output produced. Automotive industry workers are meeting the challenges of more fully satisfying national economic needs for truck transportation with greater productivity and better fuel economy, cars with a higher technical level and better use features, highly maneuverable lift trucks, consumer goods that are in great demand, broad introduction of current scientific and technical advances at the plants, a significant rise in production efficiency, and economical use of labor, materials, and energy resources.

While continuing to increase its contribution to raising the efficiency of the national economy and its intensification, the Ministry of Automotive Industry will pursue further development of the policy of accelerated production of large-capacity diesel-powered truck trains while reducing the production of trucks with carburetor-type engines. By significantly updating the structure of truck production the total load capacity of trucks is to be raised to 5.6 million tons, which means more than 20 percent compared to the 1980 level with practically no quantitative increase in production.

For the needs of the mining and raw materials sector of the economy the Belorussian Automotive Plant is expanding the production of mine dump trucks by 34 percent over 1980. Their total load capacity will increase by 60 percent with the delivery of the new BelAZ-7519 dump truck with a load capacity of 110 tons (see Figure 1 below) and the BelAZ-7521 dump truck with a load capacity of 180 tons (see Figure 2 below), which has a specific metal-intensity figure 10-15 percent lower than for series produced dump trucks and provides 2.2-3.5 times greater productivity in hauling mining rock. The production of mine dump trucks with load capacities of 75 tons will more than triple during the five-year plan.



Figure 1.

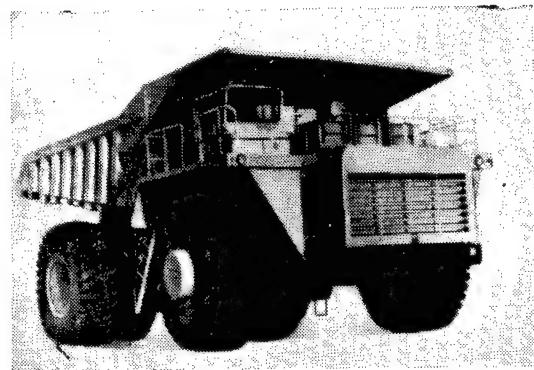


Figure 2.

The Kremenchug Automotive Plant imeni 50-Letiya Sovetskoy Ukrayny will organize production of a new series of triple-axle trucks, including the KrAZ-6505 dump truck with a load capacity of 16 tons (see Figure 3 below).

In order to carry out the Food Program worked out following the resolution of the 26th party congress and approved by the May 1982 Plenum of the CPSU Central Committee, plants and organizations of the sector will develop new, specialized agricultural vehicles and deliver them to production. Among them will be agricultural dump truck-trains with a load capacity of 14 tons whose production has already begun at the Kama Truck Plant, and fundamentally new transportation-production dump truck-trains, the KAZ-4540 with a GKB-8535 trailer and load capacity of 11 tons (see Figure 4 below) and the Ural-5557 with a GKB-8527 trailer and load capacity of 14 tons (see Figure 5 below). These units are designed for work as part of a single production complex with agricultural machines. The tractors of these truck trains have improved off-road ability and tractive power on the hitch, a minimum speed lowered to three kilometers an hour, and several power take-off devices to drive external equipment. The Kama Truck Plant will begin production of full-drive trucks with GKB-8350 trailers (see Figure 6 below) and load capacity of seven tons designed for work under difficult road conditions in rural areas. The Gorky Automotive Plant will raise the load capacity of the GAZ-53 truck to 4.5 tons.



Figure 3.

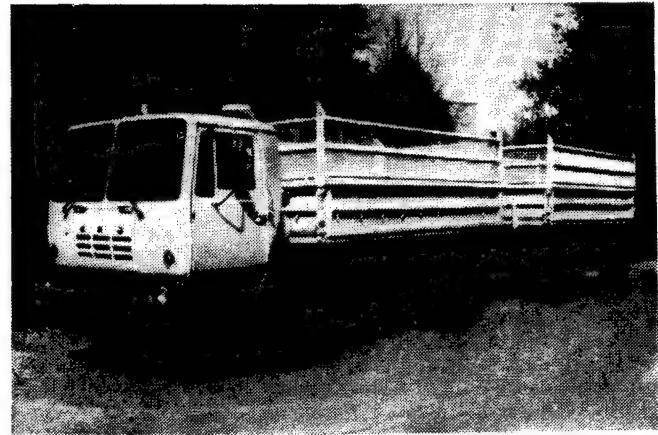


Figure 4.

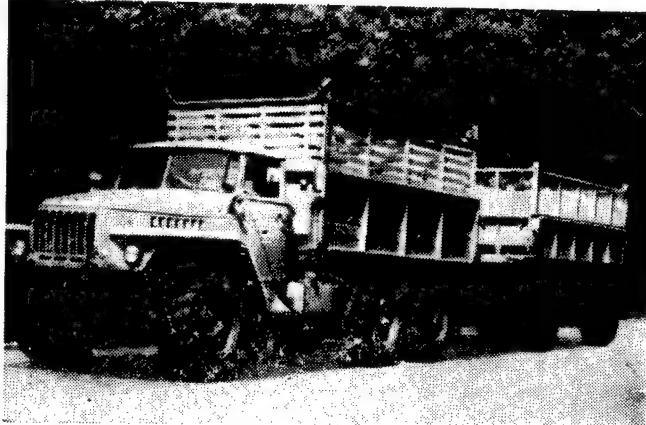


Figure 5.



Figure 6.

As a result of all this the total load capacity of dump trucks and truck trains produced for agriculture will increase 680,000 tons in 1985, almost three times greater than in 1980.

The specialized transportation needed by agriculture will also receive further development. Capacities are being built to produce large tanker trucks to haul petroleum products and water and specialized means of transportation to haul complex liquid fertilizers. In addition, production of refrigerator trucks and other vehicles will be organized. The production of tractor trailers will increase by 32 percent; this includes raising the production of trailers with

load capacities of nine and 12 tons to 75,000 units a year (73 percent) and increasing the production of trailers with capacities of 45 cubic meters to haul light freight by 1.6 times. Preparation is underway to produce two new models of trailers with a total load capacity of up to 27.5 tons for the K-700 tractor. Preparations are underway for the Pavlodar Tractor Plant imeni V. I. Lenin to produce a new 240-kilowatt eight-cylinder diesel engine.

In order to develop intercity and international shipping and solve the problem of taking the load off the railroads the Minsk Automotive Plant has begun production, based on the three-axle MAZ-6422 tractor with 235-265 kilowatt engines, of truck trains with load capacities of 28-31 tons using three-axle MAZ-9398 tractors (see Figure 7 below) and two-axle semitrailers. For the same purpose the Kama Truck Plant will produce truck trains with load capacities raised to 20-22 tons (instead of 14-16 tons) based on both three-axle and on the new two-axle tractor with the load on the drive axle increased to 13 tons. The Moscow Automotive Plant imeni I. A. Likhachev has already begun producing truck trains with load capacities of 18 tons using ZIL-133 tractors equipped with Kama Truck Plant diesels.

Production capacities at the Stavropol and Krasnoyarsk truck trailer plants are being increased to provide trailers for Kama Truck Plant and ZIL tractors. Significant attention here is being devoted to the development of production of semitrailers which makes it possible to organize transportation work in a highly efficient manner and minimize the downtime of tractors for loading-unloading work.

There will be continued development of specialized means of transportation with good off-road capability designed for work under roadless conditions and in high and low temperatures. These machines are extremely necessary for development of inaccessible regions of the Far North, Siberia, the Far East, and Central Asia. For example, by incorporating production of new full-drive vehicles at the Kama Truck Plant and the Kutaisi Automotive Plant imeni G. K. Ordzhonikidze and expanding their production at the Ural, Kremenchug imeni 50-Letiya Sovetskoy Ukrayiny, and Ulyanovsk imeni V. I. Lenin plants the production of trucks with high off-road capability will increase 27 percent in the 11th Five-Year Plan. The Ural Automotive Plant will begin production of the special Ural-5920 tracked snow-swamp truck with a load capacity of eight tons (see Figure 8 below). The production and assortment of trucks in northern versions will also increase. Above all they will be modifications of the Kama Truck Plant trucks for whose production the association is now preparing and dump trucks from the Belorussian Automotive Plant with load capacities of 75, 110, and 180 tons. They will be equipped with everything necessary to operate in outside air temperatures down to 213 K (-60 degrees C), including independent engine warmers and heaters for the driver's cab.

To reduce expenditures for loading-unloading and warehouse work, in addition to increasing the production of lift trucks by 28 percent, during the current five-year plan their assortment will be expanded and, most importantly, production of new, small, highly maneuverable lift trucks designed for work in cramped conditions will be organized.



Figure 7.



Figure 8.

The production of small trucks for shipping small loads in various sectors of the economy will be expanded by development of capacities for the production of such trucks at the Ulyanovsk imeni V. I. Lenin and Yerevan automotive plants.

Thus, in the 11th Five-Year Plan there will be a further improvement in the structure of the truck fleet with an increase in the proportion of production of trucks with load capacities of more than eight tons, a decline in the proportion of production of trucks of load capacities of 2-5 tons, and a slight increase in the production of trucks with load capacities below two tons (but the shortage of the latter will still be felt). The number of specialized means of transportation and full-drive vehicles will also rise substantially.

With respect to passenger vehicles considerable attention will continue to be devoted to public transportation.

Thus, the Lvov Bus Plant imeni 50-Letiya SSSR has already begun production of LAZ-4202 medium city buses (see Figure below) with a new three-gear hydromechanical transmission that has broadened the assortment of domestic buses (medium city buses were not produced in the 10th Five-Year Plan). The design of the LiAZ-5256 large city bus (with a Kama Truck Plant diesel engine and standardized three-gear hydromechanical transmission) is being finished up, and the Likinskiy Bus Plant has begun preparation for its production. This bus has large seating capacity, better economy, and greater comfort features than the currently produced LiAZ-677M with a carburetor-type engine.

Hungarian bus construction workers from the Ikarus Plant and the Avtokut Institute are participating in working out the design and organizing its production, which has made it possible to employ a number of standardized assemblies on Soviet and Hungarian buses (front controlled and rear drive axles, brakes, suspension elements, door opening mechanism, windows, and the like) and to organize cooperative production of buses.

The Pavlovsk Bus Plant imeni A. A. Zhdanov has completed work on development of a design and begun preparations for production of the new PAZ-3205 small (seven meter) local bus (see Figure 10 below). It has greater seating capacity, comfort features, and service life than its predecessor and requires fewer expenditures for technical servicing and repair.



Figure 9.

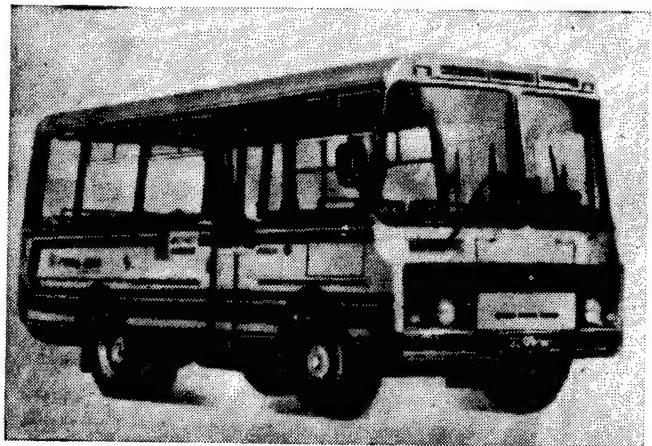


Figure 10.

The Kurgan Bus Plant is modernizing its bus to improve its comfort features, increase service life, and improve the driver's working conditions. This bus will be more suitable for difficult road conditions and harsh climatic conditions.

The RAF Microbus Plant imeni XXV S"yezda KPSS in Yelgava is also modernizing its bus. In addition, it will begin production of a series of new specialized modifications of RAF buses.

The trolleys produced by the Trolley Plant imeni Uritskiy in the city of Engels will also undergo major modification. They will be provided with 150-kilowatt electric engines and have an improved interior with more comfortable working conditions for the driver.

A great deal of work is underway in the sector to develop new models of cars and thoroughly modernize models now in production.

Of course, the Gorky Automotive Plant has begun production of the modernized GAZ-3102 Volga with a more powerful carburetor-type engine and fuel injection, which makes it possible to reduce fuel expenditures by up to 10 percent and reduce emissions of carbon monoxide with exhaust gas by as much as three-quarters. The car has front disk brakes and separate control of the working brakes. Its external lines have been improved, the interior has been redone in a contemporary style, and the trunk has been enlarged.

In addition to beginning production of the modernized VAZ-2107 car with improved comfort features (see Figure 11 below), the Volga Automotive Plant imeni 50-Letiya SSSR is working to develop a new high-economy car and to achieve further modernization of models such as the VAZ-2105 and VAZ-2121 which will continue to be produced throughout the five-year plan. Similar work is underway at the Moscow Automotive Plant imeni Lenin Komsomol and the Zaporozh'ye Kommunar Automotive Plant.



Figure 11.

The key problem of the 11th Five-Year Plan will be, of course, reducing the use of fuel and lubricants by motor vehicles. This will be accomplished first of all by a further expansion of the use of diesel engines based on full incorporation of projected production capacity for diesel engines at the Kama Truck Plant and installation of these engines in Ural and ZIL-133 trucks and LAZ and LIAZ buses. Production of six-cylinder V-type diesel engines standardized with Kama Truck Plant diesels is to begin at the Kutaisi Automotive Plant imeni G. K. Ordzhonikidze in 1983.

In 1981 the Yaroslavl Motor Plant began production of a new series of economical eight and 12 cylinder turbocharged diesel engines with 265-480 kilowatts. They are designed for installation in modernized BelAZ mine dump trucks with load capacities of 30 and 40 tons and the new MAZ-6422 highway truck trains with load capacities of 28-31 tons. The Kama Truck Plant will begin production of turbocharged diesel engines with 190-213 kilowatts for truck trains with increased load capacities (up to 24 tons). The use of turbocharging makes it possible not only to reduce specific expenditure of fuel but also to develop engine modifications with different power and economy characteristics.

The Moscow Automotive Plant imeni I. A. Likhachev has begun building capacities to produce the first phase of VIL-645 diesel engines with a power output of 136 kilowatts. They are designed for the new VIL trucks with load capacities of 12-14 tons. The Gorky Automotive Plant is conducting experimental design work on a new agricultural truck train with a load capacity of nine tons and air-cooled diesel; this work will be completed by the end of the five-year plan.

Overall the planned introduction of diesel engines in the vehicle fleet, together with growth in the number of highly productive truck trains, will make it possible by 1985 to conserve about 7 million tons of fuel annually, which is at least 30 million calculated for the established fleet. Transferring some of the VIL and GAZ trucks to natural gas and liquefied hydrocarbons will produce a significant savings of liquid fuel (more than 2 million tons in 1985).

Work will be carried on at an accelerated pace to refine the working processes of carburetor-type engines in order to reduce specific fuel expenditures. There will be further development of projects to reduce the use of power to drive auxiliary units of the engine and to overcome friction in the engine and transmission; to use radial tires with lower rolling losses; to install front fairings on the roof of tractor cabs of highway truck trains to reduce aerodynamic drag; to develop aerodynamic forms of cars and buses; and, to employ microprocessor systems to control vehicle engines and transmissions.

All of these measures should reduce fuel expenditures for cars with carburetor-type engines with at least 10-15 percent in the 11th Five-Year Plan.

One of the new lines of development in conserving liquid fuel and protecting the environment is the use of electric vehicles. Work on this in the sector began in the 10th Five-Year Plan, which already by 1981 enabled the Ulyanovsk imeni V. I. Lenin, Yerevan, and Volga imeni 50-Letiya SSSR automotive plants and the RAF imeni XXV S"yezda KPSS Microbus Plant in Yelgava to begin production of the first batches of electric vehicles for the purposes of fully working out the design, testing them extensively under operating conditions, determining the most efficient areas of use for them, and setting up a servicing and repair system. Production of these electric vehicles will continue during the entire five-year plan with improvements in their design each year to increase their range on one charging to 80-120 kilometers, raise their traveling speed to 80 kilometers an hour, reduce their weight, and increase their load capacity. Our colleagues at the Ministry of Electrical Equipment Industry have a particularly large job to do to improve the parameters of storage batteries, raise their specific energy capacity, increase their service life, and reduce expenditures for technical servicing.

Reducing the weight of vehicles is a very important direction of work for the sector in the current five-year plan. This is to be accomplished by broad use of high-strength low-alloy steels and heat-resistant rolled metal, two-phase steels, rolled metal from light alloys based on aluminum, high-strength cast iron, design plastics, and other progressive materials. Progressive design concepts aimed at reducing the vehicle weight will be used even more broadly in new developments and in modernization of vehicles in production. Among these concepts are pneumatic and coil spring suspension instead of flat spring suspension, wedge and disk brakes, single instead of double tread broad-profile tires, front-wheel drive cars, and others. All this will make it possible to reduce the coefficient of vehicle weight by an average of 20 percent.

Work will continue on raising the service life, reliability, and quality of means of vehicle transportation. The greatest attention here will be devoted to development of equal-strength design elements, increasing their trouble-free use,

increasing their trouble-free use, and reducing the labor-intensiveness of technical servicing and repair. Suffice it to say that the service life of motor vehicle equipment is to be increased 15 percent during the five-year plan while the labor-intensiveness of technical servicing and current repair is to be reduced 10 percent.

An efficient solution to the question of organizing repair of motor vehicles and engines is extremely important to the national economy. At the present time a large number of small, poorly equipped repair enterprises and shops are employed in repair. Each year 1.8 billion rubles, 1.5 million tons of metal, and the efforts of about 450,000 persons are used for capital repair under these conditions, but the service life of the repaired vehicles and engines does not exceed 40 percent of the life of new ones on the average. Organizing capital repair of vehicle aggregates on an industrial basis using progressive technological processes insures a service life until next overhaul of at least 80 percent of the original life, according to tests. Therefore, the Ministry of Automotive Industry considers it essential to stop the repair of fully equipped motor vehicles at repair plants, replacing it with overhaul of vehicles at vehicle transportation enterprises using assemblies and aggregates rebuilt by industrial methods. The ministry not only considers it essential, but is taking concrete steps in this direction. Specifically, plans envision setting up demonstration shops and sections for industrial restoration of power plants at the Kama Truck Plant, Avtodizel', Zil, GAZ, and Avtovigatel' production associations so that the experience of these shops and sections can be put to use at all repair enterprises in the country.

The advantage here is obvious. Switching repair to an industrial basis will promote a reduction in the use of spare parts (metal) and vehicle downtime because of malfunctions, which will raise labor productivity.

During the 11th Five-Year Plan considerable attention will be devoted to work to improve the working conditions of the drivers, further insuring the safety of motor vehicle transportation, and reducing its harmful impact on the environment. For example, changes to improve the internal and external planning of cabs and their ergonomic qualities (installation of efficient new heaters, air conditioners, and noise and vibration reducing units and materials), and control systems (increasing brake efficiency and ease of operation of steering mechanisms) will be systematically introduced in vehicle designs. In addition, electronics will be used more extensively in systems to control the vehicle, signal lights, and diagnostic signals, new systems will be developed for individual protection of the driver and passengers in case of accidents, and the impact-strength characteristics of vehicle bodies and cabs will be improved. The permissible norms for emission of carbon monoxide with the exhaust gases of the carburetor-type engines of trucks will be tightened by stages (one of these stages begins on 1 October 1982 when new norms for emission of harmful substances with exhaust gases will go into effect).

Thus, for the automotive industry, as for all sectors of the national economy, the 11th Five-Year Plan is a five-year plan of struggle to intensify production and raise the quality of work at all levels. And there is no doubt that automotive industry workers will make a worthy contribution to the national movement

to carry out the historic decisions of the 26th party congress, the November 1981 and May 1982 Plenums of the CPSU Central Committee, and the instructions of General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev.

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MOTOR VEHICLE

BRIEFS

TAJIK HIGHWAY TUNNEL--A transportation tunnel whose construction has been organized in the mountains of Central Tajikistan will be cut at a height of 2,700 meters. Yesterday a convoy of heavy bulldozers began to clear the way to the entrance of the tunnel on the northern slope of the Hissar Mountains. The tunnel will ensure year-round traffic on the Dushanbe--Leninabad highway, which is usually closed for 6 months because of snowslides. [Text] [Moscow TRUD in Russian 20 Apr 82 p 1] 7045

TRUCK-MOUNTED DRILLING RIG--The new URB-2.5A2 drilling rig for geological prospecting has been designed by a team at the All-Union Scientific Research Institute of Petroleum Machinery headed by chief designers G. Borchenkov and S. Mel'nikov. The rig, which is mounted on a ZIL-131 truck, has high productivity compared to present rigs, affording an annual economic benefit amounting to more than 3 million rubles. In 1982 the rig will go into series production at the Kishlinskiy Machinebuilding Plant in Baku. The photograph shows G. Borchenkov, chief designer, with a model of the new drilling rig. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 24, Jun 82 p 18] 7045

NEW ROAD-PAVING MATERIAL--Work teams of the Latvian Roadbuilding Trust Lattyumen'dorstroy, which are now in their third year of building highway routes in the Yamalo-Nenetsk Autonomous Okrug, have built an experimental 7-km section of road. Its principal distinguishing feature is that a flexible [original reads "texturized"] material--dornit--is used in the pavement instead of heavy reinforced-concrete slabs. This section has passed the tests. Use of the new material makes it possible to eliminate the road base of crushed stone or gravel. Building each kilometer of the route consequently costs 60,000 rubles less than the construction cost of the same section of a conventional highway. It is also important that use of the new technology greatly reduces the amount of heavy physical labor. The pace of construction of roads laid under the problematical hydrological conditions of the North is increased many times over. There is a substantial reduction of consumption of such a valuable and scarce building material as cement. Other roads with a similar surface will also be built in the okrug. The material for them (incidentally, chemical industry waste is used as the raw material) will come from Latvia. In all, the Trust Lattyumen'dorstroy will build at least 30 km of such roads every year in the North. [By N. Mikhalkchuk] [Text] [Moscow PRAVDA in Russian 22 Jul 82 p 1] 7045

INDUSTRY HEAT RECOVERY--Methods developed by the Moscow Institute of the Petrochemical and Gas Industry for secondary utilization of the heat of the products of combustion drawn from thermal installations are being used successfully at the Moscow Motor Vehicle Plant imeni Leninskiy Komsomol and the Bryansk Machinebuilding Plant. This makes it possible to save fuel and combat pollution of the environment. The method of secondary utilization of cupola furnace gas has been introduced in the foundry of the Bryansk Machinebuilding Plant. "Cupola furnace gases," says A. Zuyev, docent of the Moscow Institute of Petrochemical and Gas Industry, "are simply emitted into the atmosphere as a rule. The temperature of these gases is about 500°, and in addition they contain a large amount of extremely toxic carbon monoxide. We proposed a scheme to additionally equip the cupola furnace that would immediately solve several problems. First, at the outset we complete the combustion of the carbon monoxide, which, as is well known, is flammable, and we thereby clean the cupola furnace gases. Second, we use this additional heat to heat the air in a special device--a recuperator--to which the hot gases are led. Then this air heated up to 200-300° is used as a blast in the cupola furnace. After all, if hot air is fed to the furnace, this will greatly increase its efficiency and reduce the percentage of scrap." Anyone who has ever visited a foundry or forge knows how difficult it is to work there: the air is literally saturated with the heat of the furnaces. That is why wherever possible heavy-duty air conditioners are installed in these shops. Where is the energy to come from to operate them? But it turns out that the heat itself might come in handy in solving this complicated problem. There are designs of air conditioners which can use the heat of the products of combustion as energy on which to operate. [By S. Artyukhov] [Excerpts] [Moscow TRUD in Russian 21 May 82 p 2] 7045

AUTOMATED MOTOR PRODUCTION--In the Altay Motorbuilding Association the entire production of basic parts for motors has been turned over to automatic machines. There are 14 automatic production lines comprising 114 metal-working machine tools. Production capacity has consequently increased 35 percent, the accuracy of machining parts has risen substantially, and the labor of 160 highly skilled workers has been saved. The photograph shows the complex of automatic production lines. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 24, Jun 82 p 15] 7045

LARGE WHEEL CHANGING DEVICE--How to change a wheel? It seems an idle question in the case of a Zhiguli or Volga. But when there is a breakdown on a heavy-duty BelAZ dump truck, whose wheel weighs almost 4 tons? In the main specialized design office of the Lvov Internal-Combustion Lift-Truck Plant a mechanism has been developed which is "up to" removing and mounting wheels of the largest diameter. Metal grabs clamp the tire, separate the wheel from the hub and place it on the ground properly. Easily taking up the new wheel, the internal-combustion lift-truck mounts it accurately on the lugs of the shaft. By the end of the year several tens of such machines will have been manufactured; they make it possible to eliminate laborious operations in repairing large trucks. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Jul 82 p 2] 7045

NEW HIGHWAY BRIDGE--A new highway bridge has connected the banks of the Amur near Komsomolsk-na-Amure. This crossing provides the city a reliable connection with Khabarovsk and other industrial centers. [Text] [Moscow KRASNAYA ZVEZDA in Russian 13 Jun 82 p 1] 7045

MOSKVICH MOTOR PRODUCTION--Shop collectives of the Ufa Motorbuilding Association have been working very strenuously. Since the beginning of the year about 1,400 motors for the Moskvich car have come off the assembly line over and above the plan. This year, competing for a worthy celebration of the 60th Anniversary of Formation of the USSR, the collective has assumed the obligation of sending consumers more than 126,000 motors in new modifications bearing the prestigious pentagon. Tens of thousands of such motors have already come off the enterprise's assembly line. [By I. Payvin] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Jun 82 p 2] 7045

FOAM-SEALED TRUCK BODY--Chemists of the Production Association "Korund" have set up a reliable barrier against grain losses on the highways. In conjunction with scientists they have developed and introduced a technology for sealing truck bodies with fast-hardening foam. The operation can be performed even under field conditions. It is sufficient to have a compressor and a sprayer. The liquid penetrates into all chinks and by forming a foam it firmly stops them up. This year the enterprise is shipping to various regions of the country material sufficient to seal the bodies of 160,000 trucks. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Jun 82 p 2] 7045

GAZ'S TWO-MILLIONTH CAR--On 19 July 1982 ceremonies marked the two-millionth car to come off the assembly line at the Gorkiy Motor Vehicle Plant. [By G. Ivanov] [Excerpt] [Moscow PRAVDA in Russian 20 Jul 82 p 2] 7045

HIGHWAY CONSTRUCTION ENGINEERS TRAINED--The Bryansk Technological Institute will begin to train highway construction engineers. Enrollment of secondary school graduates for the new specialization has been announced at the School of Construction Engineering. "We have organized the training of these engineers at the request of construction enterprises and local soviets of people's deputies," the rector Ye. Murakhtanov said. "Year after year the volume of road construction has increased in the Nonchernozem Zone of RSFSR. In the current 5-year period, for example, plans called for building 1,600 km of main hard-surfaced highways in Bryansk Oblast alone. That is why there is an increasing demand for qualified specialists. Still more of them will be needed in connection with performance of the USSR Food Program." [Text] [Moscow STROITEL'NAYA GAZETA in Russian 20 Jun 82 p 2] 7045

VACUUM-PLASMA SPRAY COATING--A new technology for strengthening the most important assemblies and parts of a machine and tools will make it possible for the Minsk motor vehicle builders to considerably increase the reliability and service life of the new line of MAZ-6422 heavy-load tractor-trailer units and to reduce the costs of manufacturing them. A new unit has gone into operation at the Minsk Motor Vehicle Plant for vacuum-plasma spraying of wear-resistant titanium coatings on cutting blades. The thickness of the layer applied is only 5-8 microns, but the service life of the parts in this "clothing" is almost doubled immediately. The annual saving from its introduction amounts to more than 100,000 rubles. Along with laser strengthening, this method will in the future be used also in manufacturing parts of the steering mechanism, coupling device and other exceedingly important assemblies of the Belorussian truck. Comparative laboratory tests conducted along these lines have yielded favorable results. "Up to now widespread dissemination of this progressive method has been held up in the industry by the lack of highly productive equipment that is simple to manufacture and operate," I. Gurdus, deputy technical director of the

association, told the BELTA [Belorussian wire service] correspondent. "The unit we have introduced will make it possible to realize more fully the advantages of a new technological process. It is no accident that it was successfully demonstrated at the USSR Exhibition of Advances of the National Economy and aroused great interest on the part of visitors." This unit was set up by scientists of NII Tavtoprom [Scientific Research Institute for the Technology of the Automotive Industry] jointly with specialists of Belavtomaz. [By V. Perzashkevich] [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 15 Jul 82 p 2] 7045

NEW BELAZ DUMP TRUCK--A new dump truck in the BelAZ line is capable of working with the large-capacity dredging equipment which can literally remove mountains; this dump truck is able to carry those mountains. The truck body takes a load of 180 tons, which the truck carries at a speed up to 50 km/hr. This giant has been assembled at the Belorussian Motor Vehicle Plant, where tests have begun. "These trucks play an important role in developing underground resources," said L. I. Dobrykh, the enterprise's chief designer. "After all, the decisions of the 26th party congress especially emphasized the need to develop at an especially fast pace the most efficient open-cut method of mining coal and other minerals by extensive introduction of progressive technology and mining transportation equipment with high unit capacity. It is precisely for this purpose that the Basic Directions for the Economic and Social Development of the USSR called for organizing the production of highly efficient quarry dump trucks with an especially high load capacity during the current 5-year period. The 180-ton truck, which will be manufactured in series, meets those requirements." It is expected that these trucks will be used at the Kansk-Achinsk and Ekibastuz fuel and energy complexes, the country's largest, to carry the millions of cubic meters of overburden. [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 27 May 82 p 2] 7045

AID IN ORGANIZING PRODUCTION--The Ministry of Automotive Industry has called upon the leading enterprises of the branch--MAZ, KamAZ, UralAZ [the Minsk, Kama and Uralsk Motor Vehicle Plants, respectively] and others, as well as project planning and technological institutes to come to the aid of the Krasnoyarsk Trailer Plant in organizing production and in working out production technology. The top leadership of the ministry has taken the progress in attainment of rated capacities under its supervision. Responsible officials of the ministry were sent to the plant to decide the problems that arose speedily. The mixed work-team form of the organization of work, combined with payment by the job, has been introduced in order to hold personnel and to raise labor productivity in the steel casting shop. The effort being made is creating the necessary prerequisites for a substantial increase of the plant's output of trailers. This year the planned growth of the volume of production is 25.6 percent, and the output of steel and iron castings will double. [By N. Zhugin, member of the Collegium of the Ministry of Automotive Industry] [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 82 p 8] 7045

KAMAZ REPAIR BAY DEVELOPED--A specialized bay for maintenance of KamAZ motor vehicles has been developed in the scientific-production association Avtotrans-tehnika. It can be used for mechanized replacement of the front, middle and rear axles, transmission, and reduction gear clutch. Adoption of the specialized bay at a trucking enterprise reduced the labor intensiveness of replacing units and assemblies of KamAZ trucks from 6 to 44 percent in various stages of the operations involved. The annual economic benefit was 6,700 rubles. [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 2 Jul 82 p 2] 7045

PRODUCTION MILEPOST--The 100,000th small car produced since the start of the year has come off the conveyor at the Izhevsk Automotive Plant. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 35, Aug 82 p 3] 11176

KUTAISI AUTOMOTIVE PLANT--Georgian SSR--In the 11th Five-Year Plan the Kutaishi Automotive Plant must build capacities to produce 20,000 agricultural truck trains a year. The photograph [not reproduced] shows the new aggregate wing at the plant. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 29, Jul 82 p 2] 11176

CORRECTIVE STEPS TAKEN--On 11 August a published comment by the RSFSR Ministry of Procurements reported that grain hauling to elevators in the Tatarskaya ASSR was going slowly. According to figures on the use of transportation in the autonomous republic during the harvest period the average output of motor vehicles was indeed very low, 6.2 tons a day. The RSFSR Ministry of Motor Vehicle Transportation has ordered the Tatar Transportation Administration to take urgent steps to speed up grain hauling to the elevators and improve the use of vehicles in gathering the harvest. [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 14 Aug 82 p 1] 11176

CSO: 1829/291

RAILROAD

BETTER USE OF LOCOMOTIVES URGED

Moscow GUDOK in Russian 5 Sep 82 p 1

[Article by GUDOK correspondent A. Yudanov from Gorkiy: "A Powerful Locomotive Should Pull A Heavy Train. Let's Give a Precise Rhythm to Traffic!"]

[Text] In No. 141 of GUDOK, dated 18 June 1982, our correspondent's article "The 5,000-Ton Trains Are Coming" related that with the introduction of new electric locomotives, the VL80s, on the Gorkiy Railroad's Kirov section, it became possible to handle trains weighing 5,000 tons. Unfortunately, such trains are few; up to now, the powerful electric locomotives are not being used efficiently enough.

Therefore, the editors return to this problem anew, hoping that unwavering attention will be paid to utilizing this large reserve.

Was it long ago that the new VL80s electric locomotives were operated on the small section of track from Lyangasovo to Balezino? Today they cover an area of approximately 1,000 kilometers from Balezino to Vladimir.

The effective use of these electric locomotives depends not only on the Gorkiy railroad workers but also, to a considerable extent, on the workers from the neighboring Perm Division of the Sverdlovsk Railroad. Until now, not enough 5,000-ton trains have been arriving at the Balezino junction station. In June and July, the neighboring workers sent only about 400 trains, weighing between 4,400 and 4,600 tons. Also, the work teams at Lyangasovo are using powerful VL80s locomotives to pull underweight trains.

V. Trapitsin, deputy chief of the traffic division for the use of the locomotive pool, says that "because such underweight trains arrive from the Sverdlovsk Railroad, our daily shortfall in transport is as much as 20,000 tons of freight." Additional trains must be put together. But that causes large expenditures and a lowering of the division's traffic potential.

Dispatcher L. Chemodanova adds that "as a result, a problem arose: either supplement the underweight trains in Balezino, where there aren't enough classification tracks, or supplement the trains in Lyangasovo, where things aren't much better."

Until now, the arrival of 5,000-ton trains from the Sverdlovsk Railroad has been extremely irregular. Therefore, it is very difficult to plan on bringing the VL80s electric locomotives, capable of hauling such trains, into Balezino. Yet, the crews at Lyangasovo somehow adjusted to these circumstances: they use a single VL80s section to haul light trains and empty through-trains. They do this without detriment to the technical conditions of the electric locomotives and without infringing on the transit time between stations. But most often, the locomotive's power is under-utilized. Nor is the situation any better for the return trip. In Vladimir, about 1,000 tons of empty cars are coupled to a VL80s and hauled through the entire Gorkii line to the Sverdlovsk Railroad.

The directors of traffic service explain this extravagance by the fact that many trains from the Moscow Railroad arrive via Vladimir at the end of reporting days and there is not enough time to precisely regulate the issuing of locomotives from the technical servicing point. Thus it happens that the first available locomotive is coupled to a train of empty cars.

Also, the lack of coordination between the Kirov workers and their colleagues from the neighboring Buysk Division of the Northern Railroad hinders the normal operation of the powerful electric locomotives. The Gorkiy and Northern Railroads have a common area for operating electric locomotives. Already in 1973, the chiefs of these railroads established regulations, by joint order, for the procedures of operating, servicing and repairing locomotives, plus procedures for crew operations. Time has shown that this decision was a correct one. Sending electric locomotives to the adjacent Buysk and Kirov divisions enabled locomotive productivity to increase by more than 100,000 gross ton-kilometers. Interchange through the Svecha junction station increased by seven trains.

But, for some reason, this experience was not extended to the VL80s locomotives. At one of the junction meetings, N. Sokolov, chief of the Buysk Division, asserted that track facilities in Svecha were poorly developed and that crews at the Shar'ya Depot had not been trained in driving new machinery. But after all, Balezino doesn't have enough classification tracks, while at the Lyangasovo Depot, competent and experienced crews did not suddenly appear.

As a result of all this lack of coordination, the Kirov workers have to do a lot of switching work, shortening the 5,000-ton trains heading for the Buysk Division from Lyangasovo Station. At the very least, each day in Kirov 4 of these trains have 600 tons apiece "chopped off," and only after this has been done are the trains dispatched to Svecha.

And there is another proposal of the Kirov workers which has not been accepted in Buysk.: Send VL80s locomotives with heavy trains to Svecha and return the locomotives with the same trains to Lyangasovo.

So-called gathering tracks are being laid now at several stations of the Gorkiy Railroad, based on a proposal by division chief Yu. Parfenov. As a result, lengthened tracks are being formed for accommodating long and heavy trains so they can be passed by passenger trains.

In Lyangasovo, an additional exit to Gorkiy has been made from the transit yard. This allowed trains weighing up to 10,000 tons to be formed and dispatched with two locomotives, without hampering traffic.

But the output from the powerful VL80s electric locomotives is still not large. Effective use of the new locomotives depends, to a great extent, on the neighboring railroads. I think that the Main Administrations of Traffic and Locomotives might have something to say about this problem. The powerful electric locomotive must haul heavy trains.

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CSO: 1829/319

RAILROAD

ELECTRIC LOCOMOTIVES PRODUCED AT NOVOCHERKASSK

Yerevan KOMMUNIST in Russian 20 Jul 82 p 1

[Article by NOVOSTI Press Agency Correspondent R. Kvyatkovskiy:
"Novocherkassk Electric Locomotives"]

[Text] The Electric Locomotive-Building Plant in Novocherkassk is proceeding with serial production of the new 10,000 horsepower VL-84 locomotive. The designers at the enterprise are working on the next model--the 14,000 horsepower VL-85 locomotive. The production of powerful, fast switching electric locomotives is connected with the expansion of our country's network of electrified railroads, particularly with the activation of the Baykal-Amur Main Line.

Naturally, production of the new models required an improvement in the production process itself.

Valentin Shiyan, chief of the Production Engineering Department at the Novocherkassk plant, says that "we are renovating the enterprise. After the renovation is complete, we will produce 700 locomotives per year, which will be more than double our current production rate. Robots will be used in foundry work. In the maintenance shops, there will be new specialized machine-tools, machine-tools comprised of standard units, machine-tools with numerical program control and automation lines. Changes are occurring throughout the entire production process. Alongside existing buildings, new buildings are appearing which not only enable expansion of the scale of production but enable, for the first time in our country, establishment of a unique assembly line for electric locomotives. And such an assembly line will entail a new level in labor productivity."

Valentin Shiyan continues: "by investing millions of rubles in renovating the plant, we are not only thinking about improving labor productivity, although that is extremely important. The new buildings, filled with light and air, the automatic and semi-automatic machines and the robots obviously represent an effort to improve the people's work conditions."

Naturally, the new improved equipment requires increased skills from the workers, including new trades which the workers must learn. This training is being conducted at the plant under the guidance of the trade union. To

learn new trades, the workers are being sent to other enterprises, or are increasing their skills right at Novocherkassk.

The social aspect of the renovation is not limited to just the enterprise itself. Adjacent to the plant, five-story and nine-story apartment houses for the workers are being built. The renovation plan provides for construction of 250,000 square meters of new living space--about 8,500 apartments. One-fifth of this program has already been completed.

Schools, kindergartens, a shopping center, social center, hospital and a library are being built simultaneously with the apartment houses. It is planned to build a combined sanatorium-dispensary on the picturesque bank of the Don River for the electric locomotive-building workers and a vacation hotel for the plant, on the shore of the Black Sea.

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CSO: 1829/319

RAILROAD

DELAYS IN LOCOMOTIVE REPAIR REPORTED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Aug 82 p 1

[Text] In our correspondent's article "Instead of Help, We Get Promises," published 13 May 1982, the topic was that preparation of large coal reserves in the Kuzbass [Novokuznetsk Coal Field] and in Ekibastuz is being hindered by lengthy idleness of locomotives. Dozens of powerful locomotives stand idle, awaiting repair.

N. Galev, deputy minister of the electrical equipment industry, informed the editors in an official reply that our newspaper's article had been considered at a meeting of the collegium of the Ministry of the Electrical Equipment Industry. The article's critical comments about the ministry were acknowledged as being justified.

To draw up urgent measures for helping the "Kemerovougol'" [Kemerovo Coal] and "Ekibastuzugol'" [Ekibastuz Coal] Associations, the Ministry of the Electrical Equipment Industry together with the USSR Ministry of the Coal Industry set up a working commission with the participation of the manufacturing plants and consumers. Measures for organizing the repair of locomotives were developed and approved.

At the "Ekibastuzugol'" Production Association in 1982, the amount of repair to electric locomotives will total 600,000 rubles. In the "Soyuzelektroremont" [expansion unknown] system, a plant is being set up to repair and operate electrical equipment for the Ekibastuz coal-miners. As early as 1983, the amount of major repair to electric locomotives at this plant will total 1,000,000 rubles.

In 1982, the Novocherkassk Electric Locomotive-Building Plant will deliver to the "Kemerovoughoi'" and "Ekibastuzugol'" Associations 249,000 rubles' worth of spare parts to repair "OPE-1" locomotives, in accord with the assigned funds. The plant will also produce 251,000 rubles' worth of spare parts in excess of the plan. The approved measures also provide for the manufacture of equipment for the USSR Ministry of the Coal Industry's repair bases. Quarterly monitoring of the measures' execution has been established.

In the opinion of B. Yakovlev, deputy chairman of the USSR Gosnab, the measures taken by the Ministry of Electrical Equipment Industry will enable an improvement this year in the maintenance of locomotives. He writes that,

after the list of spare parts has been developed and the spares consumption rates for OPE-1 units have been agreed upon by the Ministry of the Electrical Equipment Industry, the production of spares will be included in the State Plan for the Economic and Social Development of the USSR, and in the distribution plan.

The article was also examined in the USSR Gosplan's Department for the Electrical Equipment Industry. Yu. D'yakonov, deputy chief of the department, informed us that the issues raised in the article are pressing ones.

According to the general plan for the long-range development of the locomotive-building industry, locomotive production should be concentrated at the Dnepropetrovsk Electric Locomotive-Building Plant, after its renovation is completed. The production plan at this enterprise provides for a significant increase in output of locomotives and locomotive spare parts.

Due to the fact that the Ministry of the Electrical Equipment Industry establishes an intensive plan each year for production of electric locomotives and tractive units to be used on main lines, it is impossible at present for the Novocherkassk Electric Locomotive-Building Plant to switch over to production of the three-section OPE-1 tractive units. To equip the units with a third section, the Ministry of the Electrical Equipment Industry has been assigned the task of manufacturing and delivering 15 motor dump cars in 1982 to enterprises of the Ministry of the Coal Industry.

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RAILROAD

BAM CONSTRUCTION FROM URGAL TO KOMSOMOLSK-NA-AMURE

Moscow TRANSPORTNOYE STROITEL' STVO in Russian No 7, Jul 82 pp 5-7

[Article by V. A. Vizhaykin, chief Dal'giprotrans engineer, and Yu. A. Astaf'yev, chief project engineer]

[Text] A sizable stretch of a section of the main rail line from Urgal to Komsomolsk-na-Amure lies in a zone in which permanently frozen soils occur, and moreover this is high-temperature permafrost and is solid or insular in nature. Because the area has been little studied and reliable data necessary for planning the installations were lacking, scientific research had to be organized to study the conditions for construction in the permafrost. This work was done by various organizations, including the Skovorodino Scientific Research Laboratory, SibTsNIIS [Siberian Affiliate of TsNIIS], KhabIIZhT [Khabarovsk Institute of Railroad Transportation Engineers] and TsNIIS [All-Union Scientific Research Institute of Transportation Construction].

At the same time two interdisciplinary surveying field teams of Dal'giprotrans [Far East Planning and Surveying Institute for Transportation Construction] went to work; they included teams of surveyors and engineering geologists. A consolidated group of project planners for the roadbed was created within the surveying section.

The most recent instruments were used in the surveys: YeOK-2000 instruments, which use light to measure distance; Ni-0.25 self-adjusting levels, and Dal'ta-0-10 and Dal'ta-0-20 transits. Aerial photographic surveying was used extensively. The engineering geology work was done with drilling rigs designed by Dal'giprotrans; they are reliable in operation and have high transportability under the difficult mountain-taiga conditions and in boggy areas.

In a short time 379 km of the route were laid out under the difficult conditions of the taiga in the section between Urgal and Komsomolsk-na-Amure. Of the 12 alternative routes examined, the optimum one was chosen on the basis of technical-and-economic calculations. Simultaneously with the surveying work and preparation of the engineering plan, the project planners issued working drawings for performance of construction work on the roadbed, for stations and for civil engineering works. Electronic computers were used extensively in this.

Recommendations drafted by Dal'giprotrans for the section Urgal--Komsomolsk-na-Amure and approved by the Scientific-Technical Council of Mintransstroy [Ministry of Transport Construction] were used in planning the roadbed in the zone where permafrost occurs. The recommendations made it possible to forecast the expected depth of thawing of the permanently frozen soils when fill was placed and to plan the fill so as to take into account possible settlement of the soil of the substrate because of thawing. On that basis the embankment was designed with an adequate width so that material could be added as settling occurred. The technical-and-economic benefit from using the recommendations was about 3 million rubles.

The area through which the route passes is speckled with a dense network of rivers, brooks and ravines. In the section Urgal--Berezovka--Komsomolsk-na-Amure 18 large bridges, 54 medium-sized and 228 small civil engineering works were planned and built, including the laying of 18 corrugated metal pipes. Computation of the openings of the small civil engineering works in the eastern section of the BAM [Baykal-Amur Main Rail Line] was preceded by Dal'giprotrans' drafting of "Standard Rates of Discharge From Small Basins." The new normative document brought a saving of 2 million rubles in the Urgal--Berezovka section as compared to use of VSN [All-Union Construction Standards] 63-67.

In the designs of the large bridges metal span structures 66-110 meters long were used to reduce the number of streambed supports under the complicated conditions of the permafrost. The footings of the bridge supports were as a rule planned on reinforced-concrete columns built in place in drill holes 1.5 meters in diameter made with a Kato drilling rig; this made it possible to reduce the masonry by 25-30 percent and labor costs 15-20 percent. Prefabricated reinforced-concrete blocks with high freeze resistance and density were used instead of dressed stone to face the surface of the bridge supports; these blocks were made by the impact method; they made it possible to cut manual labor to one-fourth and the cost of the facing was reduced by 35 percent.



Sketch of the BAM route in the section Urgal--Komsomolsk-na-Amure.

The extreme conditions of production activity and of the life of the population in the zone of the line being built were taken into account in selecting

the main conceptual features for production, residential and cultural and consumer service projects being designed. The layouts and development plans for settlements made provision for straightforward functional zoning: in addition to the residential zone and utility and storage zones, production zones were set aside for the location of industrial, railroad, energy and other enterprises. In connection with development of the lumber and woodworking industry in the zone of the projected line, master plans of settlements at the stations Suluk and Gorin were prepared so as to take into account the location of the population employed in the timber industry.



Settlement at the station Berezovka.

The BAM is a construction project of the entire nation. Aside from Khabarovsk natives in the section Urgal--Komsomolsk-na-Amure, help was sent to take part in planning and building the residential settlements from TaSSR, Altayskiy Kray, and Saratov, Volgograd, Novosibirsk, Penza and Tambov Oblasts.

The settlements are being developed mainly with two-story houses made of Series 125 prefabricated components according to designs specifically developed for the eastern section of the BAM. Personal garden plots have also been provided for within the settlements (yards adjoining one-story duplexes), kindergartens and day nurseries, schools, blocks of stores, and clubs.

Because the permafrost is widespread (from 0 to -1° C) buildings and installations were designed according to Principle II (in which the permafrost is not preserved). To reduce the construction cost and to ensure reliable stability of structures, an effort was made to locate residential settlements and official and technical buildings mainly on areas where the ground will not settle during the thawing that takes place in construction and use. This made it possible to use conventional strip foundations made of prefabricated blocks. In other cases pile foundations had to be put in place, the piles being dropped into holes drilled in advance. Shallow foundations consisting of PAG, PD, PV and PTV prefabricated reinforced-concrete slabs were used for small lightweight buildings on fill.

Construction of buildings in blocks and of joined buildings, in particular station buildings incorporating rail power control stations and communications centers; combined operating and repair centers for services responsible for the track, for communications and for the power system.

All facilities for residential, cultural and consumer service and production purposes were equipped with central heating, water supply (hot and cold), and a sewer system. To improve the operating reliability of water supply and sewer system in an area of permafrost and deep seasonal freezing, provision was made to heat wells with a heater cable, to heat water at intake, to ensure circulation of water in pipes, and that water lines and pipes of heating systems were laid together.

Water, sewer and heating lines were laid underground within settlements and on the grounds of production buildings and above ground outside such areas. The lines were respectively laid in reinforced-concrete trenches or on reinforced-concrete supports placed on fill. To protect the environment the project plans called for treating effluents before discharge into rivers, biological treatment, and gases from boiler plants are also scrubbed.

The power supply of the railroad section is from the lengthwise 35+10-kv LEP [power transmission line], which uses the supports of the overhead rail contact system which were erected in the body of the roadbed within the clearances of the electrified lines. In frost-heave areas the footings of the supports were coated with BAM-4 antiheave lubricant. In order to increase operating reliability, when the 35+10-kv LEP was erected, provision was made to protect it from atmospheric shorts to ground, which would have activated circuit breakers, thereby eliminating a hazardous electrical influence on the existing communications lines and eliminating the need to remove these lines or to install devices to protect them. The economic benefit from using the sets of protectors of the lengthwise aerial lines was 650,000-700,000 rubles.

In designing the station lighting Dal'giprotrans developed and introduced designs of rigid crossbars with PKN-1500 searchlights instead of the conventional searchlight masts, which made it possible to increase illumination of the area between the tracks 2.7-fold and to cut metal consumption in half.

The project plan called for a set of measures to preserve trunk communications cable in spite of hazardous soil phenomena typical of areas of permafrost (frost heaves, frost cracks, etc.). The communications cable was laid in the body of the roadbed or on the berm. Moreover, cable with wrapped-wire armor was also used.

In 1980 the section Berezovka--Komsomolsk-na-Amure was opened to regular service as a part of the complex that could be operated separately. Work is continuing between Berezovka and Urgal. It is to go into service as a part of the complex able to be operated separately in 1982. In the process of construction the project planners of Dal'giprotrans are constantly carrying out supervision as project planners; this makes it possible to avert in good time various departures from the features of the design and changes in the construction technology, but it also affords the possibility of making speedy decisions on the construction site. The project planners are paying particular attention to problems related to changes in the hydrogeological regime of the locality as construction work is performed in permafrost soils.

An operations group has been set up in Dal'giprotrans which maintains close communication between the project planners and the builders and guarantees prompt solution of all the problems on the spot.

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RAILROAD

DETAILS OF CONSTRUCTION OF YEREVAN METRO

Moscow TRANSPORTNOYE STROITEL'STVO in Russian No 7, Jul 82 pp 9-11

[Article by engineers L. A. Arutyunov, Armtonnel'stroy [Armenian Institute for Tunnel Construction], and V. S. Arutyunov, TsNIIS [All-Union Scientific Research Institute for Transportation Construction]]

[Text] The broken relief of the terrain of present-day Yerevan with differences in elevation of more than 500 meters within the city limits made it a complicated task to choose that scheme for development of urban public transport that would best suit Yerevan's conditions. An analysis of the operation of all types of surface passenger transportation made it possible to establish the advisability of building a subway in the capital of Armenia.

The upper crust of the depression in which the city lies consists of sedimentary clay and sand. The route of the subway lies mainly in weakly cemented water-deposited gravel soils with an admixture of sandy loam particles and fractured basalt lava between 2-3 and 30-40 meters thick.

Armgiprotrans [Armenian State Planning and Surveying Institute for Transportation Construction] did the surveying and project planning of the subway.

The first section of the first phase of the Yerevan Subway connects the most heavily populated central areas to the railroad station and industrial part of the city. The length of the section is 7.6 km, of which the portion underground is 5.7 km and the surface portion 1.9 km. Along the route there are five underground stations: Druzhba, Saralandzhi, Yeritasardakan, Ploshchad Lenina, Oktemberyan and one surface station--Sasuntsi David. The station Oktemberyan was not included in the part of the project to be put into operation--it is being roughed out.

Over the period of construction, beginning in 1972, more than 12 km of road and station tunnels were built, 505,000 cubic meters of earth were moved, 44,000 tons of cast iron and 19,000 cubic meters of prefabricated reinforced-concrete lining were installed, and about 60,000 cubic meters of cast-in-place concrete and reinforced concrete were poured.

One of the peculiarities of construction of the Yerevan Subway is the extensive use of the drilling and blasting method of operation, which is because of

the rock along a substantial length of the route. In many sections the rock is highly shattered, there are clay and sand interstitial layers with insufficient adhesion between them. More than half of the route lies in waterlogged soil.

The fractured basalt lavas and their slags and alluvial boulder-gravel and gravel-sand deposits distinguish themselves among their rocks for their particular saturation with water and abundance of water. The principal source of the groundwater in these rocks is precipitation and subsurface water formed in the rock mass of lava of the volcanic upland.

The station and road tunnels were caught in water-saturated soils using forced reduction of the water level. The number of wells operating at the same time during the period of construction reached 100. Instead of placing two rows of interacting wells in lines symmetrically located with respect to the axis of the construction project, in view of the conditions of the city's development and the results of a pilot pumping operation, the decision was made to lower the water level along the route with clusters of water-removal wells, the clusters and the individual wells for reducing the water level being located at the points of greatest convenience both from the standpoint of the city's development and hydrogeological necessity, and also from the standpoint of arranging drainage and obtaining power supply.

The installations for lowering the water level were calculated according to methodological instructions of VSN [All-Union Construction Standard] 127-66; reduction of the level of groundwater was checked at given points of the projected tunnels. ETsV 12-210-85 submersible pumps were installed in the drill holes.

The total inflow of water amounted to about 6,000 cubic meters per hour; for that reason in certain sections it was not possible to completely lower the groundwater level. Nor did additional wells to reduce the water level yield constructive results. For that reason local water disposal had to be used and the tunnels had to be cut when there was water in gutters.

Proper lining structures were used depending on the geological and hydrogeological conditions. For instance, dead-end tunnels and the stations Druzhba and Saralandzhi were lined with cast-in-place concrete and reinforced concrete. Lining of prefabricated reinforced-concrete blocks was used for road tunnels in sections which were not flooded, and cast iron lining was mainly used in the flooded sections.

But gaps in deliveries of the iron tubing made it necessary to seek new structural solutions. As a result, in conjunction with project planners of Armgiprotrans a combined lining was developed on the basis of the standard uniform eight-block reinforced-concrete lining with cylindrical joints instead of expansion connections.

Two new insert blocks and antiearthquake connections were included in the design, and provision was made for subsequent erection of an internal reinforced-concrete jacket with metal insulation.

Table 1

<u>Base Value (in rubles) Per Cubic Meter of Concrete Depending on Aggregate</u>	<u>Cement Grade</u>	
	<u>150</u>	<u>200</u>
Echmiadzin tuff	8.39	8.97
Lithoid pumice	8.74	9.92
Basalt gravel and quartz sand	10.16	10.66

Table 2

<u>Types of Aggregate</u>	<u>Total Cost (in rubles) (for Yerevan) Per Cubic Meter of Concrete Depending on Grade</u>	
	<u>150</u>	<u>200</u>
Echmiadzin tuff (Akhavnatunskoye deposit)	12.93	13.50
Lithoid pumice (Dzhraberskoye deposit)	12.37	13.62
Basalt gravel and quartz sand (Spandaryanskoye deposit)	16.21	16.76

The inside diameter of the lining was increased from 5.1 to 5.4 meters. A conventional erector was used to install it.

The reinforcement of the inner reinforced-concrete jacket consists of casings with metal sheet 6 mm thick. These casings are erected with an erector after the tunnel was jointed and erection of the outer reinforced-concrete ring was completed. The sheets were joined by welding on cover straps. Concrete was poured in the jacket in 6-meter sections. This kind of jacket performs the function of waterproofing and also improves the antiseismic characteristics of the prefabricated lining.

In sections with rock of moderate hardness extensive use in building road tunnels was made of standardized prefabricated reinforced-concrete lining with a solid reinforced-concrete gutter block. Use of a solid gutter block 1 meter long made it possible to reduce the volume of excavation, to reduce the pouring of reinforced concrete by 0.36 cubic meter and to lower the cost by 100 rubles. The total saving in one section alone was 200,000 rubles.

New types of antiseismic connections have been created for combined lining: welded corner connections between blocks and anchor connections (along the axis of the elements) consisting of metal rods 18 mm in diameter sealed in holes in the ends of the blocks with expanding cement. This last type of connection is the cheapest of those available, and, very important, it does not alter the static diagram of the lining's operation.

A number of new technical solutions for station linings were also introduced during the process of construction. For instance, the station Yeritasardakan has an original three-vault pier construction (Figure 1) consisting of prefabricated reinforced-concrete tubing of the Leningrad type with an inner reinforced-concrete jacket (side tunnels) and cast iron tubing 9.5 meters in diameter (the central tunnel).

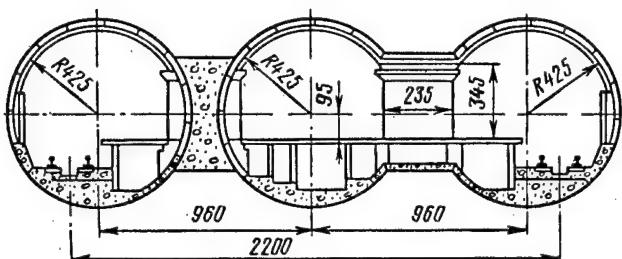


Figure 1

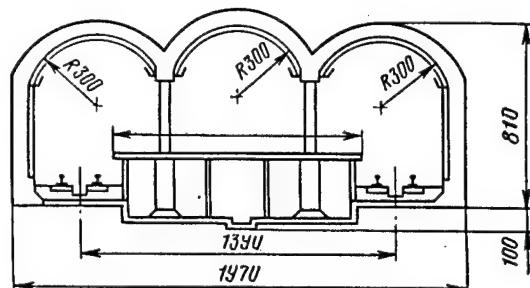


Figure 2

In rock a three-vault station of the column type was built (Figure 2) with cast-in-place concrete lining, solid gutters and columns consisting of pipes 0.7 meter in diameter filled with concrete. At the present time it is the most economical in the earthmoving, consumption of materials and total cost. In addition, the layout of the station is simple and convenient compared to constructions of other types both from the standpoint of organizing passenger flows and also with respect to location of workspace, and at the same time it meets public health and architectural requirements.

The station Ploshchad Lenina was designed as a three-vault station with two side tunnels 8.5 meters in diameter and a central tunnel 9.5 meters in diameter. Here the lining is made of cast iron tubing. The upper vaults are supported on a system of columns and crossbeams. On the whole it repeats similar features of the stations of the Moscow Subway developed by Metrogiprotrans [State Planning and Surveying Institute for the Construction of Subways and Transportation Facilities]. The columns are an exception; they were made of No 30 double T's and then monolithized with concrete. Use of this construction reduced by one-third the consumption of metal in the column.

Along the route in the first section nine vertical shafts were made: five as passages and four intermediate ones for ventilation. The passage shafts, which have an inside diameter of 5.6 meters, are built from cast iron tubing. The mouth of the shaft and the interface with the expansion of the shaft at the bottom were made of reinforced concrete. Depending on the shaft's distance from subway stations the shaft is expanded at the bottom on one side or two sides. The section of the expansions of the shaft, lined with cast-in-place concrete, was chosen to meet the condition of accommodating the track and allowing 1 meter on each side for people to pass, and in the tubing lining an inside diameter of 5.6 meters. The expansions of the shaft at the bottom are adjoined by chambers connected to the surface by drill holes with a diameter of 600 mm for delivering concrete, mortar and sand into the tunnels. This made it possible to free the shaft and to increase the time available for disposing of rock and lowering elements of the lining, long pieces and other supplies.

Location of these expansions on two sides made it possible to simultaneously cut road tunnels in both directions from the station and the side tunnels of the stations, i.e., to do work at six faces.

The stations Druzhba and Saralandzhi--which are three-vault and made of cast-in-place concrete--were built by excavation using drill and blast operations. The rock was worked and lining installed from element to element of the section. This made it necessary to blast in stages, which tended to cut down the speed of progress, but it did make it possible to carry out the construction without settling at a shallow location in the central part of the city.

The calotte in the side station tunnels, whose base is located under a cross-beam, was cut by the drill and blast method. When required by the state of the material, metal arches or reinforced-concrete anchors with a grid were used for temporary strength. As the cutting progressed, the concrete of the vault and crossbeams in a band of sheet metal was poured. After the vaultings of the side tunnels passed the calotte of the central chamber and the concrete of the vault was poured, the nucleus of the side tunnels and stopes were worked, the concrete of the walls and column footings was poured, and then the pipe columns were installed. The column filled with concrete was drawn up until it butted tightly against the crossbeam, was welded to it and then was made one with the column footing with fibrous concrete.

Concrete based on natural porous aggregates was used in making the cast-in-place lining of the stations Druzhba and Saralandzhi.* An analysis of the economic indicators of using natural porous aggregates makes it possible to discover the efficiency of using them in the concrete (Table 1).

The indicators of the efficiency of using concretes based on natural porous aggregates, taking into account specific capital investments and transportation costs for Yerevan, are given in Table 2.

ArSSR Republic Standard 1089.79 "Concrete Based on Natural Aggregates for Construction of Transportation Tunnels" was used in doing the concrete work. The Instruction for Use of Concretes Based on Natural Porous Aggregates for Transportation Tunnels, being drafted by TsNIIS jointly with ArmNIISA [not further identified], is now being prepared for publication.

The road tunnels in sections adjoining these stations were lined with prefabricated reinforced-concrete block with a blast and drill cycle covering the length of one ring (1 meter). The blocks were installed with a KM-14 stacker. Use of the prefabricated lining right up to the working face made it possible to save 150 kg of metal per meter of road tunnel because of the temporary strengthening necessary in cutting tunnels that would be lined with cast-in-place concrete.

Construction of the section under the existing pressure water tunnel, where a hydraulic wedge was used in working the rock, is of interest. This made it possible to cut the tunnel without any destruction whatsoever of the lining of the water tunnel or its surrounding mass of earth.

The three-vault pier stations Yeritasardakan and Ploshchad Lenina were built in water-saturated loose rock after artificial drainage. The tunnels were cut

* TRANSPORTNOYE STROITEL' STVO, No 4, 1982, p 12.

to full dimensions in a cycle that was 0.75 meter long. The lining of the side tunnels was assembled from ribbed reinforced-concrete blocks, and that of the central tunnel from cast iron tubing with the KM-15 station block laying machine. At the same time when the openings were made, the metal waterproofing of the side tunnels and openings were installed simultaneously. The elements of the metal waterproofing--sheet steel and the reinforcing shell--were welded to channel bar guides bolted to the lining. The space between the lining and the sheet steel was filled with concrete.

In this section five entrances to subway stations were built; they blend harmoniously into the architectural landscape of the city. The entrances of the station Sasuntsi David, Ploshchad Lenina and Druzhba are underground and are made of cast-in-place concrete and reinforced concrete. The construction of the entrance of the station Saralandzhi was designed to combine cast-in-place concrete (the wall) with rolled steel (columns and floor) and a roof of prefabricated reinforced concrete. The surface entrance of the station Yeritasardakan was built of cast-in-place concrete and reinforced concrete.

The Yerevan Subway has been decorated in simple and sensible forms using elements of the native architecture. The walls of the entrances of the stations Ploshchad Lenina and Sasuntsi David were faced with red tuff from the Byurakanskoye and Oktemberianskoye deposits. The walls of the entrance of the station Sasuntsi David were embellished with bas-reliefs on the theme of the Armenian saga of David Sasunskiy.

Marble from the Sayano-Shushenskoye and Gazganskoye deposits was used in finishing the entrances of the stations Druzhba and Yeritasardakan, and granite in the station Saralandzhi. Travertine was used to face the exterior walls of the entrance of the station Yeritasardakan and the pedestrian tunnel of the station Sasuntsi David.

In underground stations the floors consist of polished slabs of Pambakskoye and Kapustinskoye granite. White "Koelga" marble from the Urals and also "Gazgan" and "Sayano-Shushenskiy" marble from white to dark gray tones with a predominance of pink, were used to face the walls and columns.

The group of builders of the Yerevan Subway have been decorated with high awards of the homeland for their crash effort. Emissaries of Moscow, Lenin-grad, Minsk, Gorkiy, Tbilisi, Baku and Kharkov worked side by side with the local subway builders in the capital of Armenia.

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CSO: 1829/280

RAILROAD

NEW SINGLE-VAULT SUBWAY STATION COMPLEX

Moscow TRANSPORTNOYE STROITEL' STVO in Russian No 5, May 82 pp 16-17

[Article by engineers S. P. Shchukin and G. P. Kononchuk, Lenmetrogiprotrans [State Planning and Surveying Institute for the Construction of Leningrad Subway and Transportation Facilities], and N. N. Telenkov, Lenmetrostroy [Leningrad Administration for Subway Construction]]

[Text] During the current 5-year period seven deep underground subway stations will be built in Leningrad, six of them single-vault.

Three single-vault stations--Chernaya Rechka, Pionerskaya and Udel'naya--are being built in the fourth section of the Moskovskaya-Petrogradskaya Line. Moreover, all the installations and equipment of each of the stations are located under a single vault.

The design of this deep underground station complex was prepared for the conditions of Leningrad in Lenmetrogiprotrans. Thanks to a new engineering solution it has become possible to reduce labor costs in building the station complex and to fully mechanize operations by using an integrated set of equipment, to minimize deformation of the tunnel lining and settling of the floor surface, to reduce the number of types and sizes of reinforced-concrete components, and to improve operating indicators.

The complex (Figure 1) brings under a single arch the following technologically related elements: the exhaust chamber 1 containing the escalators, the station's passenger room 2 with work space 3 under the platform and at the end of the station, the toilets 4, the traction and stepdown substation 5, the ventilator complex 6, the crossover chamber 7 for trains to reverse direction, and a line-change chamber should it be necessary to join a second inclined passage or line-change facilities.

Although the complex was specifically worked out for section four of the Moskovskaya-Petrogradskaya Line of the Leningrad Subway, it can also be used on other subway lines located in analogous engineering-geological conditions.

Alternative versions have been prepared for the configuration of the station complexes for different cases: for way stations and terminal stations, with provision made for rolling stock to reverse direction, and with one and two exits.

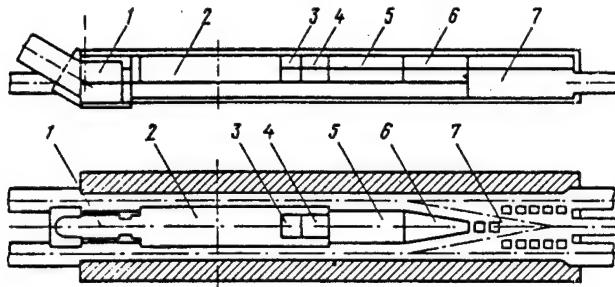


Figure 1

The standard cross section of the principal load-bearing structural elements of all the station installations (Figure 2) consists of prefabricated multi-hinge vaults pressed into the rock: the upper vault with an arch 0.5 meter wide and an inverted vault with an arch 1 meter wide, consisting of reinforced-concrete blocks and supported on solid cast-in-place concrete supports. The latter are built in the station's side tunnels, which have a diameter of 5.6 meters and are made of a prefabricated reinforced-concrete lining pressed into the rock; they were constructed by the set of machines used for start-to-finish cutting of the tunnel between stations.

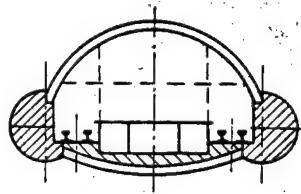


Figure 2

In a vault with standard section a reinforced-cement canopy is envisaged with a system of drainage installations to collect and carry away groundwater. The exhaust chamber, located in the section of standard structural elements, has a greater depth of the gutter portion. The wider space between tracks (14.6 meters) makes it possible to accommodate ET-2 four-belt escalators. The length of the platform section of the station is 120 meters assuming a six-car train in service.

The station's platform, constructed of prefabricated reinforced-concrete elements, is 11.7 meters wide. Under it are located the work space for the technological equipment and service personnel, buses and local water treatment facility. Channels and panel boxes for wiring installations are located in the track walls of the platform section.

On the opposite side from the entrance to the station provision has been made for a section that would extend its structures another 13 meters, which would be developed for work space and toilets, which makes it possible for it to be used in the future in building a transverse chamber for joining a second entrance to the station.

The combined traction and stepdown substation (STP) is located in an extension of the middle chamber of the single-vault station on the side opposite to the inclined passageway. The total length of the STP is 41 meters, including 10 meters in the full section of the station's central chamber and 31 meters in the service portion between the tracks of the dead-end tunnel. The equipment of the STP is located in the lining of the single-vault station, which is divided into two stories and a basement. At the present time the total length of existing substations accommodated in lining with a diameter of 8.5 meters is 57-60 meters.

The standard section of the station's construction in its extension beyond the end of the platform section is again used as the principal load-bearing lining of the STP and the crossover chamber. The roof of the STP and the work space on the second floor under the tracks in the area of the crossover chambers are made of prefabricated reinforced-concrete elements supported on cast-in-place reinforced-concrete joists and columns, walls and intervening partitions--mainly of prefabricated reinforced concrete.

The dead-end crossover tunnels for rolling stock, in which a technical inspection station is provided for, join the crossover chamber to the cast-in-place reinforced-concrete endwall. The complex's full length is 252 meters.

The composition of the set of structures when provision is not made for the rolling stock to reverse direction is distinguished by the absence of the crossover chamber and, as a consequence, location of the STP in the section with constant width of the space between the tracks, which makes it possible to reduce the length of the STP section to 30 meters. The interior arrangement and purpose of the structures for the two variants of the composition are analogous to what was described above. The full length of the complex when the rolling stock does not reverse direction is 230 meters for an eight-car train and 190 meters for a six-car train.

In calculating the safety structures the magnitudes of rock pressure and over-load coefficients were determined on the basis of experience in building the single-vault deep underground stations of the Leningrad Subway at Ploshchad Muzhestva and Politekhnicheskaya, research of the Leningrad Scientific Research Laboratory of the All-Union Scientific Research Institute of Transportation Construction on the stressed state of their structural elements, and also on the basis of the capabilities of ET-2 escalators. The calculated vertical load, equal to the maximum value of the full weight of the overlying rocks, was determined by the method of stratum-by-stratum summation according to the data of physicomechanical properties of the rocks of the specific geological drill holes along the route at places where stations are to be built in section four of the Moskovskaya-Petrogradskaya Line.

The static computation of the elements of the standard section of load-bearing structural elements of the single-vault station was done on computer according to a program based on a method of the All-Union Scientific Research Institute of Transportation Construction. The upper vault of the station in the open system (without the inverted vault) was calculated as the vaulted series of hinge-connected curved beams on a flexible base supported by massive supports.

The stress of prior compression or the weight of the rocks over the station were taken as the load.

In calculating the closed system, which consists of two hinged vaults (the upper and the inverse) and the massive supports consideration was given to the geological characteristics of the soil, the time lag between building the upper vault and inserting the inverted vault, and the forecast stresses over a period of 100 years.

Use of deep underground station complexes containing all installations under a single vault on subway lines being built is a new step in development of domestic subway construction along the road of technical progress.

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CSO: 1829/279

RAILROAD

BRIEFS

COMBINED LOCOMOTIVE--This electric locomotive can be seen only at Vikhorevka Depot. With permission from the Main Administration of Locomotives, the VL120 was formed at the depot, thanks to the inquisitive minds and initiative of designers and to the hands of innovators. The VL120 is not a new series. It consists of two low-duty, six-axle electric locomotives, currently designated VL60, which have been joined together. The VL60s have taken on a second life, having received an entirely new design for tractive engines with self-contained excitation. The VL120 is intended to haul heavy trains in severe Siberian conditions. Who knows? Perhaps the VL120 will have the honor in the future to initiate traffic on the first electrified section of the BAM [Baykal-Amur Main Line]. A large group of technicians, engineers and workers at the Vikhorevka Depot worked to create the new, powerful locomotive. Engineer V. Kashkarev, who tested the locomotive, did a considerable amount of work. Numerous trips confirmed the "viability" of the new modified electric locomotive. Photos: the VL120 on the Vikhorevka-Korshunikha section of the BAM: Engineer Kashkarev, awarded the silver medal of the VONKh [Exhibition of Achievements of the National Economy of the USSR]. Photos by G. Nefedov. [Text] [Moscow GUDOK in Russian 18 Aug 82 p 2] 9 887

CSO: 1829/319

OCEAN AND RIVER

RO-RO SHIPS UNDER CONSTRUCTION IN LENINGRAD

Moscow GUDOK in Russian 20 Jul 82 p 4

[Article by Yu. Stvolinskiy: "New Ro-Ro Ships"]

[Text] At the Leningrad Shipyard imeni A. A. Zhdanov I was shown dozens of comments by seamen on horizontal-loading steamships. They are also called "ro-ro" ships. Let us look at some of the comments.

"Our experience under difficult hydrometeorological conditions on various lines with the most diverse cargo in the Far East and Southeastern Asia has revealed the excellent qualities of this type of ship" (Far Eastern Maritime Steamship Company).

"Operation of 'ro-ro' ships has demonstrated their high profitability. Loading time does not exceed 8-10 hours" (Estonian Maritime Steamship Company).

"Ship crews and Soviet and foreign pilots invariably note the excellent sea-going qualities of ro-ro ships: speed, seaworthiness, stability, turnability, and ability to travel in ice" (Kamchatka Maritime Steamship Company).

It took 694 days to build the first ship of this series, the Ivan Skuridin. The last, the Viktor Talalikhin, was built in 447 days. This is a significant time savings, especially because the last ship was more complex in its design.

The Leningrad shipyard is now building two improved ro-ro ships. The first ship is called the 60-Letiye SSSR. It is to be completed by 22 December, a great date in the history of our state.

The first ships with horizontal loading were designed at the Baltsudoprojekt Special Design Bureau. These ships do not have the traditional deck hatches through which cargo is lowered into the hold by hoisting cranes. Cargo is not lifted onto a ro-ro ship, it is rolled on. The cargo may also drive on itself along a special ramp. The best cargo for such a ship is cars, trucks, buses, tractors, road machines, and other wheeled equipment. At the same time, if necessary the ro-ro ship can also take containers.

To receive cargo the forward part of the ship is raised up by a hydraulic mechanism and inclined back. An angled ramp is fed onto the shore. There is also an

internal ramp and a hoist so that vehicles can drive to different levels of the holds. Everything is envisioned so that loading and unloading can be done quickly.

The cargo areas look unusual. It seems that you are in an enclosed stadium; they are that enormous. Up to 600 small cars can be arranged on the decks and platforms; this is 100 more than on a ship of the earlier design. Let us go up to the superstructure and open up the door to a random cabin. They are almost all single cabins, identical, with convenient planning. They have everything necessary for life during a long cruise.

The spacious wheelhouse is combined with the chartroom. This is more convenient for the navigators. Everything is right there, the navigation console, the remote control console for the main engine, and the rudder console.

Our domestic ro-ro ships are highly automated. Suffice it to say that the ship can sail for 16 hours in a row without a watch in the engine room. The watch officers will be at the central control post for the machinery. All of these ships have intricate hydraulic systems to operate the ramps and other hoisting devices. They are equipped with good ventilation, for the motor vehicles are transported with full gas tanks and it is essential to avoid a dangerous concentration of gasoline fumes.

How do ships of the 60-Letiye SSSR class differ from the Ivan Skuridin series?

Boris Siderov, chief designer on the project, says: "The hull is 12.6 meters longer compared to the ro-ro ships produced earlier. We made a so-called 'cylindrical insert' along which the cross-section of the hull and its lines do not change. This increases displacement and, naturally, cargo capacity. Displacement will increase from 10,500 tons to 12,000 and the total length of the ship will be 153.6 meters. But with this substantial increase in displacement the general design of the hull and propeller-rudder complex and the power output of the main engine and auxiliary engines remain the same. Thus, without radical changes in the ship design we can increase carrying capacity 20 percent. The loss of speed because of the increased hull length will be insignificant. Its speed is entirely proper for a cargo ship, 16.7 knots. The ship will be able to carry an additional 100 motor vehicles or 59 large containers on each trip while the ship's power plant uses the same amount of fuel as before. It has been calculated that the money spent for modernization will be paid back in the first year of operation of the ro-ro ship."

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CSO: 1829/317

OCEAN AND RIVER

RIGA PORT ELEVATOR UNDERUSED FOR HANDLING GRAIN

Moscow VODNYY TRANSPORT in Russian 17 Jul 82 p 2

[Article by V. Lushchevskiy under the rubric "Transportation Support for the Food Program": "The Port Elevator Is on a Diet"]

[Text] On the banks of the Daugava bordering on the second operations region of the Riga seaport are the grounds of the port elevator. The only thing separating these two enterprises is a small fence. And if you look at them from the river there are no barriers at all.

In general, that is how it should be. The port and the elevator are a unified transshipping complex. But in reality there is an "enormous distance" between them. And as a result the potential of the grain docks on the Daugava is not being used fully at all.

Let us begin with a report received in the main dispatching office of the Riga seaport. In early June seven large grain ships were standing in the roadstead of the port. The total amounts of this primary cargo that was waiting its turn for transshipment was 250,000 tons. On good days when everything goes right for the dock workers the docks on the Daugava transship 15,000 tons of grain.

The port and railroad workers have so much to do that there is hardly time to turn around. The grain docks are never quiet. A hot summer on the grain conveyor is nothing new for the Riga dock workers and we did not present this picture of their everyday doings because of the novelty of the situation. The point is that at the same time the Riga port elevator, which belongs to the Latvian SSR Ministry of Procurement, is by no means complaining of difficulties transshipping grain.

About a year ago a report entitled "Freight Moved by Pipe" appeared in the local press. It described the first test with the use of new technology at the elevator for receiving grain from sea-going ships. Together with their partners, the port workers, representatives of the elevator carried out a certain modernization; specifically, they ran a receiving gallery with conveyor lines down to the shore and put in a large bunker. A floating pneumatic reloader was included in the complex.

I recall that all the participants were satisfied with the experiment at the time. It was good that the workers in the first operations region of the port

would be able to transfer at least part of their enormous burden to their less busy neighbors. It seemed possible that this burden would be further eased if grain transshipment at the docks of the port elevator became a constant process.

Did this in fact happen? What part does the elevator play today in processing grain that arrives in Riga by sea? Does its participation have an impact on moving important cargo through more quickly?

All these questions had to be clarified during my meeting with A. Zhaleyko, director of the Riga Port Elevator Production Association.

He said, "Our elevator is 30 percent loaded on the average, and sometimes it is even less. We wait and wait for ships, but there aren't any. We have enormous reserves. In May we worked just 10 days, and spent all the rest of the time with nothing to do. To be honest, the collective feels very bad about this forced idleness. Our people know how hard the dock workers next door are working and how long the sea-going ships stand in the roadstead. But here we are 'on a diet' and this is not the first month. If we had a permanent reloader things would be greatly improved. But as it is we work on the principle of 'a teaspoon an hour.'"

The port elevator is essentially empty and its potential still awaits its time. The initiative that was once shown was not developed. As a result an average of just 3,000 tons of grain a month is transshipped by this method, while the managers of the elevator themselves are convinced that it could receive and ship at least 80,000.

Of course, the Riga Port Elevator Production Association has its own view of the problems on which better use of the enterprise's capacities depend.

"If the port workers would only give us a permanent floating reloader," they say longingly, "that would be an entirely different matter."

Let us try to adopt this point of view and figure, even if roughly, how feasible this dream is and what it would mean in economic terms. The pneumatic reloader used at the elevator's dock during the experiment was too expensive for the dock workers. It was bought to process large sea-going ships in the roadstead because steamers with large drafts cannot approach the docks under full load. The productivity of the reloader when used in the roadstead to move grain from a ship to a lighter is 7,200 tons a day. But when it is used at the dock of the elevator it cannot process more than 2,000 tons a day.

The conclusion is obvious: such expensive and highly productive machinery can wisely be used only for reloading grain in the roadstead. It was decided to use the pneumatic reloader at the elevator only when gaps occurred in reloading work in the roadstead and it was not needed there. But there are not enough such gaps for grain processing to be done consistently at the elevator and enable it to get its optimal 80,000 tons a month.

All of the current troubles of the port elevator unquestionably arise because it was initially oriented only to tranship grain for export. It is able to receive

grain for storage and ship it out. But if it becomes necessary to unload ships it needs a reloading mechanism that moves bulk grain from the holds of the ships onto shore.

Thus the light blue building which looks so large and solid above the Daugava can really be "brought to light" only if it is given its own reloading equipment.

In the longer run this can be done by a fundamental reconstruction of the port elevator, expanding its dockfront and railroad sidings, and equipping the complex with up-to-date technology. This takes time and in this case we should not expect a quick solution to the problems.

A more short-range and realistic step would be to buy two floating cranes with load capacities of 15-20 tons for the Riga seaport. As soon as they are available to the dock workers it will be realistic to process small-capacity ships at the docks of the port elevator. When this is possible, naturally, the volume of grain processing will rise sharply. According to calculations by specialists, 16,800 tons could be transshipped through shore storage facilities each month!

We should also remember that the elevator has one great advantage over the ordinary grain docks in the port. It can transship grain regardless of the availability of railroad cars. It has somewhere to store this valuable commodity while rolling stock is being prepared. The elevator has accumulated good experience with unloading grain to the railroad; the elevator can take 25 railroad cars at one time for grain shipping.

All the arguments suggest that very serious attention should be given to reconstruction and fuller use of the capacities of the Riga port elevator. The qualitatively new approach to processing food cargo demands this.

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CSO: 1829/306

OCEAN AND RIVER

SOUTHERN PORTS USE ROBOTS, CONVEYORS TO HANDLE SACKS

Moscow VODNYY TRANSPORT in Russian 17 Aug 82 p 2

[Article by A. But: "Robots on the Docks"]

[Text] Cargo in sacks accounts for about seven percent of the structure of cargo turnover at ports of the Southern Basin. Handling these sacks is the most labor-intensive process. Labor expenditures here are 2-3 times higher than for processing other general cargo. To get by without sacks the port of Novorossiysk decided to transship large volumes of cement in bulk. A dock was allocated for this purpose and equipped with special devices to deliver the cement to sea-going ships directly from factory pipelines. As a result, productivity there has reached 5,000 tons a day, heavy labor by port workers has been completely eliminated, and there is no longer a need for railroad cars to ship this cement or bags to pack it in.

Before this innovation, however, there was an equally interesting and progressive method of mechanized transshipment of cement in sacks and shipping in stacks on pallets. This method is also used at the present time.

Preparation of production-technical facilities in the ports and on the ships promoted successful implementation of this shipping. Cement was transshipped by a fully mechanized procedure.

A great deal of work has also been done on automated arrangement of sacks on the pallets. These operations are done by robots. The Black Sea Central Planning and Design Bureau developed a special arrangement for eight sacks in each layer of the stack to insure reliable shipment of cement by sea and also maximum loading of customers' motor vehicles with highly productive processing of these ships. Under this plan the sacks are arranged on the pallet by a robot, which eliminates heavy labor by workers. These robots have already been used for several years in the ports of Novorossiysk and Taganrog.

In addition to cement the port workers also have to handle other types of cargo in sacks. Specialists at the port of Novorossiysk and the Black Sea Central Planning and Design Bureau have proposed a variation of the universal robot to stack various types of sacked cargo on wooden pallets. Special areas in the ports of Ilichevsk and Novorossiysk will be equipped with these robots in 1983. And in places where the cargo flow of sacks is small and setting up a specialized area is not economically advantageous conveyor systems have already been applied. They greatly ease the working conditions of the port workers who are unloading sacks of cargo from boxcars.

OCEAN AND RIVER

PROGRESS REPORT ON GRAIN HANDLING AT RIGA PORT

Moscow VODNYY TRANSPORT in Russian 2 Sep 82 p 2

[Article by V. Rubtsov, Riga, under the rubric "Watchguards of the Grain Harvest": "Cargo Number One"]

[Text] A line of railroad cars loaded with grain stands at the dock. In just a few minutes it will move out beyond the gates of the port. The stevedore and brigade leader of the consolidated comprehensive brigade are satisfied. Work went at a good pace today and there were no delays in any stage of the technological process.

"Cargo number one" is what workers of the Riga seaport call all types of grain products which are passing through their docks. There is not a day when the first operations area does not process one or several large ships that have delivered this truly golden cargo. And the port workers focus all their attention on unloading the steamers as quickly and economically as possible using the most sophisticated technological schemes.

If we bring up the question of participation of watchmen in this process, their job above all is to see that there are no losses when the grain is trans-shipped from the ships to the railroad cars. At the same time, people's control activists believe that the trains must be dispatched in such form that they will not lose a single kernel of grain en route, because each of them is worth its weight in gold.

The level of monitoring of the grain conveyor achieved today is the result of extended and painstaking efforts. Therefore, obviously, its story should begin with cases that occurred in the past but have now been practically eliminated.

What mistakes did the members of the people's control post most frequently note in their reports until very recently? The first was that the grapple carrying the cargo from the ship toward shore would every now and then pour out a fine stream of grain on the dock. This kind of grapple is really wasteful and it would be unforgivable if controllers did not pay attention to its defects. So they sounded the alarm at the most diverse levels and would not settle for promises alone. The result is apparent: this year the watchguards had virtually no criticism of grapples in poor condition.

Another mistake that was also frequently encountered was spilling grain outside the mouths of the bunkers. If a brigade was working with heavy grapples with capacities of five or seven cubic meters, sometimes part of the load would fall on the roofs of the cars. At best these deposits were swept onto the dock later, but in some cases the cars with a layer of grain on their roofs set out on the journey, attracting flocks of birds.

To eliminate the losses it was decided to outfit the grain docks with mobile bunker devices of adequate dimensions to minimize the grain spillage. The bunkers of this improved design were fabricated for the dock workers by their neighbors at the Riga Ship Repair Yard.

We should note in passing that even though it was still not possible to avoid slight spillage, now this grain is not lost. It is included in estimates, weighed, the proper documents are made out, and it is sent to the agroindustrial complex for use at poultry farms or as livestock feed.

Not all the railroad cars delivered to the sidings of the port are suitable for grain cargoes. Here the watchguards must pay closest attention. More than once in the past their inspections, which were frequently conducted together with representatives of Goskhlebinspektsiya [possible State Grain Inspectorate], revealed residue from freight carried earlier and other defects in the cars delivered for grain.

Joining their efforts with the group of people's controllers of the station, the port watchguards have been able to practically eliminate complaints of this sort in recent months.

Carwashing and preparation at the marshalling yard is no longer the weak link in the grain conveyor for Riga. Nonetheless, even today watchguards periodically make surprise visits and inspect each car carefully. It is important to prevent spoilage of the cargo and possible losses en route right here, at the starting point of the transportation chain.

The pilot people's control group, which has been headed for many years by chief port production engineer Ye. Kuz'man, and the post of watchguards of the first operations area headed by A. Pogrebnyak operate actively and vigorously in this area. The high and uncompromising principles of the watchguards, who put state interests above anything, sometimes help reveal shortcomings and focus the attention of the administration and public organizations on unsolved questions.

The people's controllers of the ports are working with tripled energy today to fulfill their important obligations during realization of the USSR Food Program. Contacts with related workers are being strengthened, with representatives of the Riga-Krasta port station and the rolling stock preparation station. They are searching for additional ways to achieve precise work.

Different forms of publicizing inspection results and putting them in graphic form are used extensively in the campaign against shortcomings. Publications of a satirical newspaper are regularly posted by the main gates of the port. Its articles frequently are devoted to people who have been criticized for careless, poor-quality work or still have not learned to conserve public property. This type of criticism is highly effective. Hardly anyone wants to be featured in the gallery of perpetrators of defects and waste more than once.

OCEAN AND RIVER

DESIGN IMPROVEMENTS PROPOSED FOR PRODUCE SHIPPING ON VOLGA

Moscow VODNYY TRANSPORT in Russian 11 Sep 82 p 1

[Article by B. Nikitenko, candidate of economic sciences, under the rubric "Transportation Support for the Food Program": "Reserves for Increasing the Shipment of Vegetables"]

[Text] The sharp increase in shipment of vegetables and melons places an important challenge before river workers. To be specific, already in 1982 the fleet of the Volga Unified Steamship Company alone must ship 210,000 tons of tomatoes and melons from river points in Astrakhan and Volgograd oblasts to the central and northwestern regions of the country and to the Suburals. By the end of the 11th Five-Year Plan this volume will more than double, reaching 425,000 tons, and tomatoes will constitute about two-thirds of this cargo.

Such a significant increase in shipment of vegetables and melons demands that river transportation solve a number of complex problems. The Food Program envisions construction of 90 specialized river-going vegetable ships. But the first one will not be built until the second quarter of 1983, the second will not come until the third quarter of that year, and in the current five-year plan as a whole only 24 such ships will be launched.

It appears that they will be good ships with a shallow draft of 1.8-2.5 meters, cargo capacity of 600-1,300 tons, and traveling speed of about 20 kilometers an hour. But as we see, construction has just begun. Therefore, the bulk of vegetable and melon shipping will be done as before in conventional diesel ships, and more than half of the shipping will be done by the 140 ST and GT class ships with cargo capacities of 600-700 tons. They have a draft of 1.7 meters and are capable of taking on cargo from small, shallow-water docks. This covers a majority of the docks. In Astrakhan Oblast alone 30 of the 45 vegetable shipping points have old, shallow-water wooden docks equipped with low-productivity belt conveyors.

In addition to the ST and GT class ships 15 diesel catamarans, 10 Okskiy class diesel ships, and other ships with cargo capacities of 2,000 tons will be enlisted to ship produce from the lower reaches of the Volga. But these ships need deeper berths, and it is very important to load and unload them quickly to preserve the quality of the produce.

Already today we do not have enough small ST and GT class ships, and with a significant increase in the volume of produce shipping this shortage will become even more critical. Therefore, it is very important to disseminate progressive know-how on increasing their loading, in particular with tomatoes. In this respect we should give special attention to the work now being undertaken by the Minister of the River Fleet to rig up ST-600 class ships with a removable intermediate deck that makes it possible to carry an additional 50 tons of tomatoes. Thus, the average tomato load in boxes of the first 15 ST-600 ships that arrived in the Northern and Southern ports of Moscow in 1982 without intermediate decks was 233 tons, while for ships equipped with the intermediate deck it was 287 tons for ST-629 ships and 292 tons for ST-659's, 54 and 59 tons more respectively. Furthermore, whereas the average decrease in the quality of tomatoes during time of delivery to Moscow's Southern port in ships without intermediate decks was 6.9 percent, for the diesel ships equipped with intermediate decks the decrease in quality was 3.7 percent for the ST-629 and 3.5 percent for the ST-659.

If we consider that the traveling speed of ships carrying an additional 50 tons of load is reduced insignificantly and essentially remains the same, while the increase in loading time is just six hours and unloading time only three hours (including installation and removal of the intermediate deck), then in the four round trips which each ship normally makes in a navigation season time expenditures are increased by 1.6 days and operating costs by 1,350 rubles. But at the same time shipping income increases 4,800 rubles, and profit rises 3,450 rubles. With the cost of an intermediate deck being 5,300 rubles additional capital investment is repaid in 1.5 years. But the main thing is that four ST-600 ships equipped with intermediate decks carrying tomatoes do the transportation work of five unmodified ships.

The Volga Unified River Steamship Company has already installed intermediate decks on seven ST-600 ships. The design of these decks, which was proposed by the GTsKB [possibly State Central Design Bureau], is comparatively simple. Metal beams weighing 350 kilograms are mounted in the lower part of the coamings of the cargo holds. Wooden panels are laid on them, and an additional 4-5 layers of boxes are placed on the panels. Not only does this increase the loading of the ship, but also it makes the work of the people easier because before when the boxes were laid in 18 levels they had to be lifted manually to a height of three meters.

The commission that observed unloading of tomatoes from a ST-629 ship in Moscow's Northern port expressed unqualified approval of equipping ships with intermediate decks. But we cannot forget that the primary burden of operating ships with these decks falls on the ship crews. The pay scale of work for installing and removing such a deck is a little more than 30 rubles, but unfortunately even this small amount of money is not now paid to the crew of the ship.

In addition, it can happen that the mountings of the intermediate deck are damaged when a grapple is working in the hold or during the loading and unloading of large items of cargo in the initial period of the navigation season. This also must be taken into account and crews should be paid for additional work to repair the deck. It is also important that the GTsKB continue work to refine the design of the intermediate decks.

The main thing here is to make the sockets for the removable beams more compact and to combine the distances between the beams and existing shore conveyor lines in a more acceptable way so that it will still be possible to load boxes of tomatoes into all the holds simultaneously. Equipping the 88 ST-600 ships with removable decks would free 18 diesel ships for additional vegetable and melon shipping, help significantly improve the supply of food to industrial centers, and give river transportation more than 300,000 rubles of additional profits.

In addition to equipping ships with intermediate decks attention should be devoted to shipping boxes of tomatoes on standard pallets. This would make the unloading of ships both faster and easier, while ships can be loaded by more extensive use of more productive machinery.

During the last navigation season 65 percent of the melons from the lower Volga was shipped in containers. In 1982 this progressive method will be developed further. Unfortunately, tomatoes are still not shipped in containers because designers have not yet come up with a container suitable for this kind of shipping. Therefore the proposal of the Southern port in Moscow deserves the most serious attention. They themselves have built experimental containers that hold 100 boxes of tomatoes apiece. Loading Okskiy and Shestaya class catamarans with these containers could greatly speed up the shipment of this valuable product.

Hundreds of ship crews and brigades of port workers are engaged in shipping vegetables and melons today. Broad application of progressive know-how and technology that improves the delivery of valuable produce from the fields to the stores is the best contribution that river workers can make to realization of the Food Program.

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CSO: 1829/336

OCEAN AND RIVER

NEW MECHANIZED DOCK IN TALLINN

Tallinn SOVETSKAYA ESTONIYA in Russian 17 Aug 82 p 2

[Photo caption]

[Text] Mechanized dock No 16 in the Tallinn commercial seaport was turned over for operation after reconstruction ahead of schedule. The new dock is designed to process 250,000 tons of export-import cargo a year.



The carrying capacity of the port was increased significantly by its launching, and ship loading and unloading time was reduced. Reconstruction of two other docks continues at the Tallinn commercial seaport. This work is to be completed during the current five-year plan.

The photograph shows the reconstructed dock No 16.

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CSO; 1829/308

OCEAN AND RIVER

BRIEFS

NEW YENISEY PORT—In a short time the Peschanka river port on the Yenisey near Krasnoyarsk will be expanded and redesigned on the basis of a plan from Lengiprorechprans [Leningrad State Institute for Planning and River Transportation]. Several large ships will be able to tie up at the docks at once. All cargo-handling operations are to be mechanized. During the intensive months of the navigation season 10 gantry cranes will be used in the port, vehicular roads and railroads will cross the territory, and warehouses and customs houses will be built to store the cargo. In addition to the production zone plans also envision several administrative areas where the management buildings, domestic quarters, and other essential services will be. [By V. Konstantinov] [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 29 Jul 82 p 1] 11176

GRAIN DELIVERED TO KIEV—Kiev—The first grain from the new harvest has been delivered to the ports of Kiev from Kherson by the diesel ship Amu-dar'ya. It opens regular grain runs, for which careful preparations have been made on the river. Special docks, reloading bunkers, cranes to transship grain into railroad cars, and small mechanized equipment — everything is outfitted to prevent the slightest losses and to protect grain against contamination and humidification. During preparation for grain shipping the river workers modernized four diesel ships with a total cargo capacity of 800 tons and carefully repaired 24 hold-type vessels. The carrying capacity of the fleet has been raised to 1 million tons of grain. The conveyor moving grain from the ship to the railroad car to the motor vehicle is working at a good pace. Vigorous competition among associated workers is supporting it. [By Zh. Tkachenko] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Aug 82 p 1] 11176

NEW YENISEY PORT—In a short time a major new river port will appear on the Yenisey near Krasnoyarsk. Properly speaking, the port already exists, but it will be fundamentally redesigned according to a plan from the Lengiprotrans [Leningrad State Planning and Surveying Institute of the State Industrial Committee for Transportation Construction]. Several large ships will be able to tie up to the docks of Peschanka (that is the name of the port) at the same time. Plans call for mechanization of all cargo-handling operations. During the intensive months of the navigation season 10 gantry cranes will be in operation, roads for motor vehicles and railroad tracks will cross the port area, and warehouse customs storehouses will be built to store cargo. [By V. Konstantinov] [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 17 Aug 82 p 1] 11176

NEW FREIGHTER—A new river-sea dry-cargo ship has been launched ahead of schedule. It was built by workers at the Krasnoye Sormovo Shipyard in Gorky. The ship has been given the name of the well-known Latvian Revolutionary Martyn Latsis. In one trip the steamer can carry 3,000 tons of various types of cargo. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 35, Aug 82 p 3] 11176

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END